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## The Alleged Water-Power Trust.

Mr. Pinchot, for whose efforts at preserving the forests of the country we have only praise, seems to have become somewhat unnecessarily excited over the water-power situation. He has been misled, apparently, by the fact that two or three large companies furnish nearly all the power transmission apparatus, into thinking that the power plants are actually under their control and that a group of powerful financiers are endeavoring to grab the hydraulic resources of the country. We have been familiar with the development of electrical power transmission in this country from its very beginning, and can assure the worried Mr. Pinchot that he is wasting breath in barking up the wrong tree. The history of power development in this country tells the truth about the situation, and in brief it is substantially as follows: From more than a half century back the chief streams of the East have been under development strictly for local use. The rivers of the New England States in particular have been worked up very carefully in the interest of the textile and lumber trades. The developments are mostly in the hands of old and close corporations as far removed from the speculative grasp of high finance as it is possible to imagine. The same conservative interests are now at work in many parts of the South forestalling in so far as may be the southward drift of textile manufacturing.

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When in the early '90s electrical power transmission became practicable, hydraulic properties heretofore unutilizable became useful. Already many had been employed locally for electrical purposes, and the new possibilities of transmission merely extended the list. The early transmission plants for the most part bought and paid for their equipment in the ordinary course of business. As their success was demonstrated, powers more difficult to develop and more distant from a market began to be exploited and their owners often came to the great manufacturing companies for help, since at that time capital in general fought shy of electrical power transmission. Being in business to sell apparatus and having the faith in electrical transmission that is born of intimate knowledge of the facts, the great companies sometimes came to the aid of transmission projects by taking their bonds in part payment for apparatus or lending their influence in helping the placing of securities. This they did to encourage the business on which their own prosperity depended. More often they turned down applicants for such assistance in whose projects they did not feel proper assurance. Those who, from the inside, have tried to get apparently sound propositions through the deadly gantlet of the auditors militant will smile at the idea that the great manufacturing companies have been plotting control of the hydraulic resources of the country. As a joke the accusation is a howling success, but that is all.

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After nearly a decade of struggle through hard times, electrical power transmission became a definite and acknowledged success and a legitimate and conservative form of investment.

The capital at last was ready to take up the work of development and larger enterprises began to be set on foot. But this confidence on the part of capital came too late to enable it to grasp the hydraulic resources of the country. We think it is not too much to say that in no industry with a similar total investment is there so little community of ownership and action. Something like 900 electric stations already own and operate their own water-powers and these plants are nearly all independent. The few holding and operating companies that own groups of electric stations actually control a very small part of the whole. It is true that here and there groups of independently developed powers have been physically merged into networks. Such merging, however, is technically very desirable since it enables a fuller and more economical utilization of the forces of nature. Two power plans worked together can generally be made to give a larger output than if worked independently and the full employment of the nation's hydraulic resources demands the linkage of many units into such networks. But there is no sign that the networks now formed are part of a deep-laid plot for general control. On the contrary, they are quite independent and are likely to remain so.

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The facts on which Mr. Pinchot's error is based are merely those which apply at large to any attempt at government control of natural resources. Capitalists big and little spontaneously rise in revolt at any action in any sphere that threatens their chance for private gain. Public ownership is the nightmare of high finance under all circumstances and it is fought against with desperate energy. Undoubtedly there is opposition to the reservation of water-powers just as there is to forest preservation, or to public ownership of coal mines and railroads, or to such a parcels-post scheme as the country bitterly needs. We have so long lived under the "Prosperity be dammed" principle that large and small interests alike resent a change such as Mr. Pinchot is trying to bring about. He is up against a hard fight in which we wish him success, but he fights not a "Water Power Trust," but the "Zeit-geist" of our century and people. Everything he wins from it is a gain for posterity though his battle is against desperate odds. He complains that the laws are made by and for the benefit of the "interests." He may be right, but the proper remedy is to unmake the laws, not to break them. The President's long judicial experience inevitably leads him to this view which is not likely to be changed. We hope Mr. Pinchot will do all he can legally to conserve the nation's hydraulic resources and so to preserve them as to ensure their wise and full employment hereafter. He need not fear the opposition of a "Power Trust," which is only a specter of his imagination. Opposition will come vigorously enough from things that really exist. As a matter of fact, the time has now come when water-powers are of increasing value and form sound and profitable investments. For their best use they should be developed on a comprehensive plan and not at haphazard, so that the deliberation ensured by government control would be in the long run a good thing for everybody.

## Workmen's Compensation Laws.

In various European countries, notably in Belgium, England, Germany and Austria, industries are so organized that in the event of injury to a workman by any accident, he receives compensation, the amount and duration of which depend upon his wages, and upon the duration as well as on the severity of his injury. The cost of insurance against such injury is added, either directly or indirectly, to the cost of production. In this country there is at present no such legal compensation to the workman, although such legal enactments have been frequently recommended by ex-President Roosevelt in speeches and communications. At the present time, the question is under the consideration of at least one State Legislature, having been referred to a special committee of the Massachusetts Legislature. It is fair and desirable that a workman should be compensated for injuries that disable him. It is also reasonable that the cost of such compensation should be added to the cost of production in each industry. On the other hand, it is very important that the compensation should be given carefully and in order. Above all, it should be contributory, or it may do more harm than good. That is, the insurance fund should be participated in by the workmen collectively in each industry, so that a certain small deduction should be made from each weekly payroll toward the fund and the accounts duly published. In Germany the insurance fund is maintained jointly by the workmen, the employers and the State.

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If the injury compensation is equitably made, it is capable of assisting not only the injured workman, but also the entire country, by improving the mutual relations of labor and capital; whereas, if the compensation is either inequitably or carelessly made, it may do much more harm than good. In Great Britain, for example, the Compensation law is open to much criticism. As it stands at present, any hand-worker employed in Great Britain, including domestic servants, receiving any injury, disability, or disease in his or her employment, may demand a compensation of half-wages until recovery. In the event of permanent disablement, the half-wages may be due for life. In the event of accidental death, the payment called for from the employer is three years' wages. In Great Britain the practice of insuring regular employees of all kinds is practically universal. Insurance costs from one-fifth of 1 per cent up to 6 per cent of the wages, according to the kind and danger of employment. An average might be about 1 per cent. There are various objections made against the working of the law. One is that the insurance is not apparently contributory, while actually it is. That is to say, discrimination tends to be made against older workmen on account of increased liability to injury. Some go so far as to believe that, in the future, older workmen may have to contract themselves out of compensation in order to secure employment.

## The Difficulties of Heterochrome Photometry.

It is well known that when two steady light sources, say, incandescent lamps, are homochrome, or have the same color, their luminous intensities, or candle-powers, may be compared very closely by a good photometrist using a good photometer. The probable error of a single comparison might be half of 1 per cent with a contrast photometer. When, however, the two steady light sources to be compared are heterochrome, or have different colors, then their comparison is not so easy a matter, or, in popular language, is "a horse of another color." For instance, suppose a blue lamp compared against a red lamp. The photometrist has to estimate the relative intensity of two illuminations, namely, a blue illumination and a red illumination. It

is much harder to compare two illuminations if they have different colors than if they have the same color. One and the same observer will evince a much greater probable error of observation in the former case, and two different observers are likely to obtain widely differing mean values. According to the Young-Helmholtz theory of color vision, this increase in the difficulty of comparing heterochrome illuminations is because we have three distinct sets of color-perceiving organs constituting virtually three distinct visual senses of the same general type. When we compare illuminations of the same color, we equalize stimuli on all three color senses. When, however, we compare and seek to equalize a red illumination with a blue illumination, we are trying to compare the stimulus of one color sense with the stimulus of another color sense, something like trying to compare, by feeling, the temperature excess of a hot body with the temperature defect of a cold body. But whatever the correct theory may be, the fact is that differences in color of modern illuminants exist to a marked extent, and that photometric comparisons between them have to be made somehow.

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It was in an attempt to remedy this difficulty that the flicker-photometer was devised. In this instrument the two illuminations to be equalized are not steadily presented to the observer's eye, but are allowed to produce rapidly alternating impressions or flickers on his retina. Viewed in this way, the color difference largely disappears and a photometric balance is obtained with greater ease and definiteness. Not only is the probable error of a single comparison largely reduced, in heterochrome photometry, by the use of a flicker-head, but the discrepancies between the mean results of different observers is also largely reduced. That is to say, different observers are able to agree fairly well, in their heterochrome comparisons, when they use flicker photometer-heads. It has often been questioned whether the flicker photometer gave correct results. It has been admitted that it gave definite results, and reproducible results, on which different observers could agree; but it has been questioned whether it gave a correct illumination balance, such as might be obtained from the mean of a number of observations by a number of different photometrists comparing heterochrome steady illuminations without flicker.

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This question of reliability in the flicker-photometer is raised afresh by Mr. Lancelot W. Wild, in a recent article in the London *Electrician*. He describes, and gives the results of, a number of photometric comparisons of a tungsten-filament lamp consuming 1.5 watt per m.h.cp. and a carbon-filament lamp consuming 4.5 watts per m.h.cp. Of course, the former would give the whiter light, and the latter the redder light. These heterochrome comparisons were made with six different photometer-heads, three of which were flicker-heads, and three non-flicker-heads. The three flicker-head results agreed well together, and so did the three non-flicker-head results; but the two sets were about 6 per cent apart. That is, the flicker photometers gave 6 per cent less candle-power to the white tungsten lamp than the non-flicker photometers. Although this result is quite reasonable, and well within expectation, yet it must be regarded with caution, because only one observer was included in the test, and the result should be corroborated by at least one more observer before we accept it. Human eyes differ occasionally so widely in color preceptions that it is not safe to generalize from a single experience. Assuming, however, that the result is of general rather than of particular significance, it could be accounted for by the fact that we have in the human retina two distinct sets of light-perceiving apparatus; namely, rods and cones. The rods are believed to be possessions handed down from remote ancestors, as far back, perhaps, as fishes; while the cones are of more recent evolution in the history of our ancestors, since they left the waters for the land. Color cannot be perceived by the rods, it is supposed, and can only be perceived by the cones. The rods are capable of responding to very faint stimuli, or very weak illumination; while the cones, with their complex color apparatus, require a stronger light to excite them into action. We all know that we can still see faintly on a dark evening when all colors have faded from view.

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It has been suggested that flickering illumination can excite the rods when the cones have not time to respond. If that suggestion is correct, a flicker-photometer is a rod-perception photometer, and so evades the color difficulty by keeping the color-perception sense out of action. In that case, we might readily produce a balance of visual stimuli on the rods in the retina; but it would not necessarily be the same balance as when both rods and cones were at work. In a similar manner, the sense of taste is largely a conjoint sense of taste and smell. A person might make taste comparisons of teas or of wines after he had deadened his smell-sensation area with cocaine, but his comparisons would then probably differ from those he would make with both senses in activity. The above theory is one consideration, but the facts present another. More observations are first needed on heterochrome comparisons with flicker and non-flicker photometers. Suppose that Mr. Wild's indictment against the flicker-photometer is a true bill, does that mean we must throw that instrument out of court? Mr. Wild seems to think we must do so, at least when tungsten-filament lamps are compared with carbon-filament lamps. We must agree to this so far as concerns the proper establishment of the tungsten-filament candle-power industry. The judgment of a man on wines, with both taste and smell, is to be taken over his judgment with taste alone. The visual judgment of a normal-eyed man who sees the world clearly is to be taken over his visual judgment when he sees it only through blue spectacles. Nevertheless, the value of the flicker-photometer is, we think, too great and too well known to be set aside because it may give a one-sided view. Its view is always definite, and can be accepted subject to its one-sidedness. If, for instance, lamps are specified to be measured by flicker-photometer, the measurements might not be the same as when non-flicker-photometers were used, but they would at least be definite, and fairly capable of agreement. If then further observations should indicate a discrepancy between flicker- and non-flicker-photometers as great as Mr. Wild has reported, it would be encumbent upon photometrists to specify, as "by flicker tests," all measurements made in that way. Perhaps, in time, a table of correcting factors might be arrived at experimentally to bring flicker measurements into conformity with non-flicker measurements. The discrepancy, whatever its magnitude may be, is only another evidence of the difficulties that lie in the path of accurate photometry.

## Convention of Illuminating Engineering Society.

The third annual convention of the Illuminating Engineering Society will be held in the Engineering Societies Building, New York, Sept. 27, 28 and 29. One of the features of the meeting will be an exhibition which, besides historical and educational exhibits similar to those shown at the convention last year, will include displays by manufacturers of commercial types of electric and gas lamps, accessories and fixtures, in this respect resembling the national electric light annual trade exhibition. The exhibition will be held in a building at 5 West Thirty-ninth Street, in proximity to the Engineering Building in which the regular sessions of the society will be held. Following is a list of the papers to be presented as thus far arranged, to which additions will probably be made:

Ethics of Illuminating Engineering, by Mr. E. L. Elliott. Some Notes on Illuminating Engineering Practice in Europe, by Mr. H. Thurston Owens. The Importance of Illuminometry in Practical Illuminating Engineering, by Mr. Norman Macbeth. Efficiency of Lighting Installations, by Mr. A. L. Eustice. Shades and Reflectors, by Dr. Louis Bell. The Design of Reflectors, by Mr. A. J. Sweet. Diffusing Mediums, by Mr. A. J. Marshall. Absorption and Diffusion of Various Forms of Glass Surfaces, by Mr. Basset Jones, Jr. Factory and Mill Lighting, by Mr. L. B. Marks. The Photometric Laboratory of the United Gas Improvement Company, by Mr. C. O. Bond. The New Physical Laboratory of the National Electric Lamp Association, by Dr. E. P. Hyde. The Problem of Heterochrome Photometry, by Mr. P. S. Millar. Description of a Demonstration Lighting Installations, by Mr. W. C. Morris. Discussion of the Efficiency of the Moore Light, by Messrs. Hyde, Woodwell, Sharp and Millar.

On Monday evening, Sept. 27, there will be a reception in the assembly rooms of the Engineering Building, followed by a musical program in the auditorium. On Tuesday morning there will be a review from a point of vantage of the historical parade in connection with the Hudson-Fulton celebration.

## New York-Canadian Hydro-Electric Plans.

Plans are being drawn for three hydro-electric generating stations to utilize the falls at the Long Sault Rapids, which separate Ontario from New York, near Cornwall. The scheme involves the construction of a dam at the upper end of Barnhart's Island, the building of a lift lock and the straightening out of the course of various channels of the river. It is claimed that fully 100,000 hp can be developed.

The plant will probably be constructed and managed jointly by two companies—the Long Sault Development Company on the New York side and the St. Lawrence Power Company on the Canadian side. The companies are seeking a charter from the Canadian Parliament and the United States Congress.

## Meeting of the Indiana Electric Light Association.

Very complete arrangements have been made for the third annual meeting of the Indiana Electric Light Association, to be held in the French Lick Springs Hotel Aug. 18 and 19. The Indiana association was organized three years ago, and the conventions have been well attended.

The executive committee has prepared an excellent program consisting of papers and addresses to be presented by Messrs. P. H. Palmer, of Kokomo; G. S. Merrill, Cleveland; W. H. Schott, Chicago; A. P. Tills, Evansville; H. W. Wells, of the J. G. White Company, New York, and E. E. F. Creighton, Schenectady, N. Y. The following topics for discussion have been placed on the program: Theft of Current; Reading and Care of Meters; Water-Softening Plants; Wood-Working Plants as Power Customers; Day-Load Rates; Relations with the Public. A round of entertainment will be provided for those in attendance and the meeting promises to be the best in the history of the association.

## Proposed Protection for Linemen.

A petition signed by a large number of electrical workers of the city of South Bend, Ind., has been filed with the Council of that city asking for the betterment of electric construction and for better protection for the linemen.

The petition asks that all high-tension wires be placed on yellow cross-arms; primary and arc light wire on black cross-arms, and low-voltage wires, such as telephone, telegraph, police and fire alarm, on red cross-arms. Where high and low-voltage wires are on the same poles, the petition asks that a clearance of 6 ft. be made. All cross leads should have a clearance of 4 ft. with proper guards. High-voltage wires should be placed on the tops of the poles and no street railway lines should carry more than 1000 volts on their wires. The petition cites the great number of incidents where electric workmen had been electrocuted and little or nothing done to better conditions. The petitioners ask for due consideration of their requests to the end that their labors may be made less hazardous.

## Cascade Tunnel in Operation.

Dr. Cary T. Hutchinson, consulting engineer for the electrification work of the Great Northern Railroad's tunnel through the Cascade Mountains, has concluded exhaustive tests of the electrified section, which is now in successful operation, heavy freight trains being hauled a distance of about four miles from the yard at one end of the tunnel to the yard at the other portal. Four three-phase locomotives, constructed by the General Electric Company, are at present operated. Each of the locomotives weighs 115 tons and the recent tests show that they are fully capable of performing more work than the specifications called for. When very heavy freight trains are hauled through the tunnel, three of the locomotives are used. In addition to the trains, a heavy steam locomotive is at present pushed through in order to take the train at the end of the electric zone. So far as the brief operation of this short stretch of electric road has shown, it is an entire success. Upon the ultimate success of this piece of track depends the electrification of about 60 miles of the Great Northern through the entire Cascade Range.

## European Trackless Trolley Cars.

A committee, consisting of two of its members and the general managers of the tramways of the city, has submitted a report to the City Council of Leeds, England, on the trackless trolley cars employed in Europe. They visited the Continent and inspected various railless systems in order to advise as to the adaptability of such means of transit to the needs of English communities. The result of their observations is summarized as follows:

The three systems considered were the Mercedes-Stoll, which is in operation in various parts of Austria and was seen in Vienna; the Filovia, used on six or seven routes in north Italy, and seen in Milan, and the Max Schiemann, which is employed in Germany, especially in the Rhine Valley.

The vehicles operated under each of these systems in general appearance do not differ greatly from the familiar single-deck motor omnibus, except as to the return circuit, which is overhead. It appears that the principal difference among the various systems occurs in regard to the arrangement for keeping the two shoes on the two overhead cables.

The length of the route inspected in Vienna is about 1½ miles, where the road—of a switchback character, having at one stretch of about 100 yd. a gradient of 1 in. 10—is mac-

adamized. On this route there are two pairs of cables, one for going and one for returning cars, though elsewhere one pair is made to suffice, so that when two cars meet one has to stop and remove its connection with the wires until the other has passed. The vehicles carry 12 passengers seated, though when required an additional 12 are allowed to stand, even on the platforms, both front and back. The entrance is at the driver's end, and he attends to all the duties of a conductor as well as driver.

The committee was particularly struck with the smoothness and comfort of riding, the spring base of the truck being very well arranged. Satisfactory assurances were received as to the operation of the cars under the severest winter conditions, though it is noticed that on this particular route the cars have been running only since last October. The motors, which are each 20 hp, form the hubs of the back wheels, and the current is collected from the supply cable by means of a pair of wheels running on the top of the wire—a similar pair of wheels being used for the return. A weighted pendulum slung from a frame carrying these two pairs of wheels keeps them well pressed upon the wires, and the current is conveyed to the motors not by a "fishing rod," but by a pair of cables which allow the car to pass to any part of the road in the avoidance of other traffic. The empty car weighs 2½ tons.

The cost of the chassis of the Mercedes-Stoll is about $2.750, without body. The cost of the overhead construction is about $8,500 per mile, and the working expenses per car-mile, the committee was informed, are: Energy, $0.80; tires (total load 4.2 tons), $2.66; wages (driver only employed), $2.40; depot expenses, $0.52; taxes, management, insurance, $1.60; repairs, renewals, painting cars and equipment, $1.06; total, $9.04.

On the Filovia system the cars will take 30 passengers. A framework carrying two pairs of wheels, one pair in contact with each overhead cable, is employed to maintain the circuit. It is very similar to that used in the Mercedes-Stoll system, except that it is pressed by a "fishing rod" or "boom" against the under sides of the cables. There are two direct-current motors of 10 hp to 12 hp each, and figures supplied by a route similar to that inspected show a working cost per car-mile as follows: Cost of energy used, $0.83; general expenses, $1.188; rubber tires, renewal, $4.32; wages and salaries, $2.80; maintenance of vehicles and line, $1.24; repairs of vehicles, $0.912; total, $11.29.

The route inspected, owned by a private company, is 4½ miles long, and the fare charged is 8 cents. The vehicles are well able to reverse, turn around and maneuver without the trolley being removed, and to take heavy gradients over bad and muddy roads without difficulty, vibration or noise. The cost of overhead construction is estimated at only $3,756 per mile, but only wooden poles were used. They were, however, found to be quite serviceable.

The Max Schiemann system was seen working at Mulhausen. Here the contact with the pair of cables is maintained by means of a "fishing rod," carrying at its extremity a pair of sliding shoes. The overhead construction is similar to that of the systems previously described. The vehicle carries about 15 passengers seated. Only the front wheels have rubber tires, so that there is considerable vibration and noise. The single motor drives onto the front axle, so that the steering is comparatively heavy. The design of this type, however, is stated to be undergoing radical modification. The weight of the present empty car is 5650 lb.

It is stated concerning all of the three systems that very few hitches have been reported, and owing to the comparative lightness of the vehicle the surface of the road suffers less than in the case of a service of cars carrying their own petrol or other engines.

The committee was much impressed with the practicability of each of the various schemes, and considers that by avoiding the heavy expenditure required in the installation of ordinary tramway traction this method of conveyance offers considerable possibilities as general feeders in suburban and interurban districts to tramway systems, and is quite capable of supplying a sufficient service for thinly populated districts on a reasonably economic basis.

## Springfield (Mass.) Central-Station Report.

The annual return of the United Electric Light Company, of Springfield, covering the year ending June 30, 1909, has been filed with the Massachusetts Gas and Electric Light Commission. The company shows a gratifying increase in earnings compared with the previous year. In the fiscal year 1909 the company earned $496,437.70, against $465,682.35 in 1908, or a gain of 6.7 per cent. The operating expenses, including manufacture, distribution, office expenses, management and miscellaneous expenses, were $54.3 per cent of the gross earnings, or $269,381.88, compared with $253,471.57 last year. The balance to profit and loss for 1909 is $227,055.82, against $212,210.78 for 1908. The company declared dividends of 8.5 per cent in the fiscal year ending June 30, 1909, or $106,250, compared with 8 per cent dividends, or $84,888, in 1908.

The Springfield company's total energy sales for the latest year were 12,117,048 kw-hours, against 10,421,309 kw-hours sold in 1908, or an increase of 16.3 per cent, indicating that the public received a large part of the increased service at a lower relative cost than in the preceding year. The total energy generated in 1909 was 16,583,186 kw-hours, compared with 16,230,797 for 1908.

The company sold 73 per cent of its total energy in 1909, compared with 64 per cent in 1908, showing considerable improvement in the physical character and administration of the plant. In the following table a few data of engineering and operating interest are given, for the fiscal year 1909:

UNITED ELECTRIC LIGHT COMPANY.

| | |
|---|---|
| Income from commercial arc lights by contract | $11,563.62 |
| Income from commercial incandescent lights by contract | 20,130.64 |
| Income from commercial arc and incandescent lights by meter | 277,620.29 |
| Income from public street arc lights | 84,371.35 |
| Income from public street incandescent lights | 4,972.95 |
| Income from electric power sales | 97,778.85 |
| Total, net | $496,437.70 |

The principal gains for the year were in metered arc and incandescent service, 9.5 per cent, and in power sales, 6.6 per cent.

| | |
|---|---|
| Cost of manufacture | $132,916.38 |
| Cost of distribution | 68,003.01 |
| Cost of office expenses and management | 35,062.03 |
| Miscellaneous expenses | 33,400.46 |
| Total | $269,381.88 |

The chief gain was in the cost of manufacture, which was 13.9 per cent greater than in 1908. The company saved about 4 per cent in its distribution expense in 1909. The total number of customers as of June 30, 1909, was 3222. The company's total boiler capacity was 5300 hp, with 7770 hp in steam turbines and 2835 hp in water-wheels.

## Massachusetts Commission News.

The Massachusetts Railroad Commission has authorized the Boston & Northern Street Railway Company to issue 5883 shares of preferred stock at $115, and the Old Colony Street Railway Company 4042 shares of preferred stock at $115, the money in each case to be used to supply working capital under the law passed by the Legislature of 1909, which sought to improve the facilities of the electric transportation companies of the State in financing their affairs. The total issue amounts to about $1,140,000 at the market price set by the directors in accordance with the law permitting companies to fix the price of new securities so long as they are not sold at less than par, and subject to the consent of the Railroad Commissioners. This board has also authorized the Worcester Consolidated Street Railway Company to issue $3,182,000 in 20-year 5 per cent bonds, to refund bonds previously issued for taking over the Worcester & Marlboro, Worcester & Clinton, and the Leominster & Clinton companies. The Berkshire Street Railway Company has been authorized to issue bonds to the amount of $190,000 to pay floating indebtedness and the cost of permanent additions to the property.

At the hearing given by the Railroad Commission on Aug. 3, in connection with the continuation of a charge of 1

per cent for each transfer issued by the Middlesex & Boston Street Railway Company, no opposition appeared to the further extension of the present arrangement. This company operates trolley lines in Newton and other suburbs at the west of Boston, and within the past year absorbed the Newton Street Railway Company, which operated its transfer system at a charge of 1 cent extra per passenger transferring, under a year's trial authorized by the commission. Considering the opposition which originally developed in Massachusetts when the 6-cent fare was introduced by certain hard-pressed companies, it is most suggestive that at this latest hearing no objections were pressed against the continuance of the extra charge. The board has made a careful examination of the receipts of the Newton Street Railway Company prior to the consolidation with the Middlesex & Boston, and also of the earnings of the latter company for the month of July, 1909, and has granted in an order dated Aug. 5 the extension of the right to charge an extra cent for a transfer for a period of one year. The board states that on account of the consolidation of the companies the period should be a limited one which suitably conserves the public interest.

This decision and the absence of public opposition to the company's petition show that there is now a more favorable sentiment in Massachusetts on behalf of reasonable returns to street railway companies. Many factors have brought about this result, among them being a disposition on the part of the commission to reduce every fare case to an arithmetical situation, to a general appreciation of at least a 6 per cent dividend as a minimum fair return on the investment, and to straightforward methods of publicity on the part of the companies. Decisions granting the companies the means of maintaining themselves as going and profitable concerns are of general value to the electrical industry as a whole, since they revitalize the purchasing power of each corporation and add to its economic stability in the community which it serves.

## Marinette, (Wis.) Rate Decision.

The Wisconsin Rate Commission has issued an inportant decision cutting the rates for electric lighting and changing those for electric power at Marinette, Wis., thus winding up the case of the Menominee and Marinette Light & Traction Company. This company operates the street railway, electric lighting and electric power plants in Menominee, Mich., and Marinette, Wis., and the matter before the commission was as to the rates to be charged in Marinette. The company made application for an equalization of rates and submitted a schedule which the commission refused to allow to be put in force. The city asked for a hearing on the rates, alleging that they were unjust and discriminatory and hearings were held together.

The commission finds that unjustifiably low rates have been charged in some cases to uses of current for power and that the result of discrimination has been that rates too high have been charged for residence lighting, for part of the business lighting and for a part of the current for power purposes.

This case was gone into very thoroughly and carefully, as is shown by the fact that the application was made Jan. 21, 1908, and the decision has just been rendered after months of work on the part of the engineering force, the statistical force and the members of the commission itself. At one time the commission refused to dismiss the application of the city for lower rates. It had been maintained that the company was planning to obtain current generated by water-power, make various additions and put in improvements; but the commission held that because at some time in the future this was planned was no reason why service should not be delivered at reasonable rates at the present time.

In its findings the commission declares that electricity may be considered a service rather than a commodity and this should be taken into account. It cannot be stored up ready for use, but the plant must be ready to furnish it when required. It is declared that depreciation must be prepared for by the company and that money which should properly go into the fund for this purpose should not be paid out to stockholders. It is found that the matter of depreciation has not always been properly treated by the company.

Deterioration, rate of interest on investment and taxes and insurance are all counted as fixed charges, and it is held that they are not affected by the output of an electric plant nor by the extent to which the plant may be used. They are held to affect one consumer just as another. But the variable expenses are a different proposition and are held to increase with the output. The fixed charges are found to be generally the greater. A flat rate is held by the commission to be objectionable. In this case a consumer for a short time is compelled to pay as much as a consumer for a long time. A straight meter rate is held to be satisfactory only where all consumers use electricity in the same way. The commission says it is not fair that a consumer who uses 10 kw for 10 hours should pay as much as one who uses 100 kw-hours, the same amount, but uses it all in one hour. The latter takes too much of the capacity of the plant during the one hour to be allowed to pay as small a rate as the former. The average cost per kw-hour grows smaller as the sales of current under the same maximum demand grows larger.

In making its investigations the commission's statistical force gathered great quantities of data, and the study was a thorough one. The apportionment of the active connected load was taken up in great detail and it was decided that probably one-third of the active connected load should be charged to the residence district, and that the business houses should be charged with about 60 per cent. The capacity expense is declared dependent upon the active load while the output expense is dependent upon the output of the current.

It seems that a rate of 4 cents per kw-hour had been made for users of more than $150 worth of power. The commission declares against this. It says that there is no justification for it for it is less than the output cost and such a rate should not be allowed.

Rates of the company have been as follows: 15 cents per kw-hour for amounts up to 20 kw-hours per month; 13½ cents for the next 40 kw-hours; 12¾ cents for the next 40; 11½ cents for the next 40; 10 cents for the next 40, and 8 cents for consumption of more than 180 kw-hours per month. The commission orders a rate for incandescent lighting of 13 cents per kw-hour for the first 30 hours per month; 8 cents for the next 60 and 4.5 for each additional. It is held in fixing this rate that the active connected load or demand for residences shall be considered as 33 per cent and for business houses of 60 per cent.

An optional rate of 16 cents per month for each 50-watt lamp demanded and 4.5 cents per kw-hour for current consumed is allowed the company. The power rate is made 50 cents per horse-power per month of nominal rated capacity of the motor and 3.5 cents per kw-hour for current consumed. This is a change from a rate of 8 cents per kw-hour for users of 100 kw-hours; 7 cents for 200 kw-hours, down to 3.25 cents for 1000 kw-hours and over.

Much work was necessary on this case on account of the fact that the same company has practically all the gas, power, street railway and light utilities at both Marinette, Wis., and Menominee, Mich.

## Wisconsin Rate Commission News.

The petition of the North Milwaukee Light & Power Company for authority to change its rates was granted by the Wisconsin Railroad Commission on Aug. 3. The petition asked for a readjustment of rates in order to meet the demands of power users and to give all consumers a uniform step rate. From a careful analysis of the expense account properly apportioned between station rating and output charges, it is evident that the short-time users—those that use their equipment for one hour or less daily—receive their energy under the new rates for

2.5 cents per kw-hour less than it costs the company to supply it, and that the difference has to be made up by the long-hour users. This condition of affairs exists in practically every case, notwithstanding the lower rates usually paid by the long-hour users, but the apparent benefits to be gained under the new rates seemed to warrant its adoption.

The Chippewa Valley Light & Power Company was granted authority to issue $35,000 of first mortage, 5 per cent gold bonds to cover part of the cost of extension and additions to its railway and lighting plant.

In the case of the city of Marinette vs. the Wisconsin Telephone Company the complainants alleged excessive rates and unlawful increase in rates. The company replied that the several changes in service and rates which it had made were in fact reductions in rates, because old, primitive equipment and inferior service had been displaced by the most costly and modern equipment, giving the best possible service, as evidenced by the change from grounded to metallic circuits and the change from four to two-party lines. This case was the first formal complaint involving a telephone exchange and telephone rates and was made the occasion for an exhaustive study by the commission as necessitating the establishment of precedent.

In the investigation of the cost of service it was shown that the composite depreciation of the Marinette exchange was 8.98 per cent, or 7.32 per cent if the depreciation reserve drew 4 per cent compound interest. It appeared in the case that the Wisconsin Telephone Company charged off 4.1 per cent of its cost value on the entire Wisconsin system in 1907 for repairs and reconstruction and it was also found that the company is writing off about 5 per cent straight for depreciation, which the commission declares is not enough unless the earning rate on the money set aside for depreciation is assumed to be in the neighborhood of 10 per cent.

A point of considerable difficulty in this case as well as in every similar case lies in the proper apportionment of the cost of operation between the local exchange and the long-distance toll business, due to the absence of any system to measure the number and duration of the subscribers' calls. It was shown very clearly in the examination that the multiple party-line subscribers are not ordinarily charged enough for the service they receive, while they are also made the means of rate cutting. This disparity in the case of the Marinette exchange is shown below:

| Business. | Ratio of Total Stations. | Per Cent Earnings. |
|---|---|---|
| One party | 16.7 | 27.9 |
| Two party | 20.2 | 24.2 |
| Residence. | | |
| One party | 10.6 | 10.1 |
| Two party | 52.4 | 37.6 |

There seems to be discrimination against the business telephone, but the commission considers that this is not an unjust discrimination, but one that is warrantable and apparently axiomatic in the telephone business.

The commission flatly states that no franchise value can attach to a telephone property for the purpose of fixing rates. The public utilities law considers that utility enterprises in general are monopolistic in character, but this theory is not extended to telephone companies. Therefore, "good will," being an attribute of a competitive business, might be assigned a value in the telephone business, but the commission holds that as the competition is only a possibility in Marinette, not a controlling fact, no "good will" value can be allowed for the purpose of fixing rates.

The theory of the Wisconsin public utilities law is that rates shall be reasonable and shall be not greater than enough to yield a fair return upon the investment. In determining the investment as a preliminary process to the fixing of rates, the commission had to deal with the claims of large "intangible" franchise values as well as "going values" in both the Antigo water case and the Marinette Telephone case. Regarding the former the commission holds that if the municipality required the payment of money or its equivalent, or there was necessary legitimate payment made for the franchise, then the sum which may reasonably be said to have been paid for the franchise may be included in the valuation the same as money necessarily invested in the physical property. But the commission refuses to consider the claims of some experts and corporations that franchises for which no money was paid may have "intangible" values which should be considered in the making of rates.

It has been held by experts that "going values" should be allowed as so much per customer or as a percentage of the receipts, and some have considered it of as great if not greater importance than the physical value of the plant. The commission holds that the actual, reasonably wise expenditure of money toward getting the business of the plant established may be included in the value to be allowed for the purpose of fixing rates. Since no plant pays at the outset and the first years of operation are almost invariably accompanied by losses or necessary deficits, the commission holds that such losses may be said to represent the cost of securing an established or going business and as such may be included in the value or investment upon which the rates for public service shall be fixed. But the converse of the rule also holds—that is, if a plant has in the past earned more than a reasonable return, possibly through the toleration of excessive rates, the excess over reasonable earnings may under certain conditions be subtracted in determining the present value of the plant. That is, a "going value" may be negative. In the case of the Marinette Telephone Company, for example, the commission found upon its investigation of the financial history of the company that through a period of recent years the company had been enjoying a sufficiently high rate of return to write off the early deficits in so far as such deficits might be allowed as going value. The plant earnings have ranged from 2.62 per cent to 13.6 per cent of the inventory investment during the last eight years, but as this shows considerable instability in the telephone business, and as a reduction of 25 cents per month would reduce the revenues to 4.39 per cent, the commission concluded that, all things considered, no present reduction of rates in the Marinette telephone exchange can be ventured without utterly eliminating any margin over the cost of operation, with its attendant serious effects.

Application has just been made to the Wisconsin Rate Commission by the Antigo Electric Company for permission to issue stock to the amount of $125,000. Two applications were made, one being to issue $50,000 worth of stock and the other to issue $75,000 worth. Permission was granted the stock to be issued in shares of $100 each and to be sold only for money consideration, at a rate not below the par value. The concern has been organized to take over the plant at Antigo. Of the $75,000 issue $5,000 is to go to the former owners of the plant and $30,000 is to be used as working capital. The $50,000 issue is authorized for the purpose of allowing the company to make additions and improvements of various kinds.

## New York Public Service Commission News.

In compliance with the order of the Public Service Commission, First District, the Interborough Rapid Transit Company has placed in operation in the subway six eight-car trains equipped with side doors. The remainder of the express equipment of the company will be converted into side-door cars as rapidly as possible, and it is expected that all of the express trains will be of this character by Oct. 15.

The commission has held a hearing upon the application of the Central Crosstown Railroad Company for approval of a modification of its lease to the Metropolitan Street Railway Company. It was stated at the hearing that the Metropolitan receivers threaten to cut off the lease entirely unless they can obtain easier terms. This lease has already been modified twice, and it is stated that a deficit still exists in the operation of the crosstown lines even under the modification. The commission has as yet rendered no decision upon the point.

At another hearing, upon the application of the Third Avenue Bridge Company, the new subsidiary of the Third Avenue Railroad, for a franchise to cross the Queensboro Bridge, Receiver Whitridge explained his reasons for organizing the new company. He said that he had been advised by counsel that the

right of the Third Avenue to build extensions while in the hands of a receiver, was questionable. So he picked out a number of officials of the Third Avenue company and formed a new corporation. It was stated at the hearing that $20,000, or 2 per cent of the capital stock of the new company, had already been paid in.

The Economic Power & Construction Company has formally submitted itself to the jurisdiction of the Public Service Commission, Second District, by petitioning the commission for permission to construct and operate an electric plant at Geneva, N. Y., in connection with its steam heating plant. By the terms of its charter granted in 1893 the company was empowered without further authority of law or ordinance to use any street, avenue and public place in the State. This right was contended by the company to be valid until May 4, 1909, when the Court of Appeals held that the grant was unconstitutional and void. The company states that it has heretofore purchased the steam heating plant and capital stock of the Geneva Steam Heating Company, for $44,603, and on Feb. 3, 1908, that company was merged into the Economic Power & Construction Company; that in March, 1908, the company, acting in good faith, entered into a contract with the city of Geneva for lighting the city and gave a surety bond for $20,000 and installed in connection with the steam heating plant an electric power plant costing over $38,000. The company states that immediately after the decision of the Court of Appeals it secured a franchise from the city of Geneva, which it now presented to the commission for approval.

The Public Service Commission of the Second District has approved an agreement between the Syracuse Rapid Transit Railway Company and the Syracuse & Suburban Railway Company for the use of a portion of each other's lines in Syracuse.

The commission has given permission to the Utica & Mohawk Valley Railway Company to exercise franchises granted it by the city of Utica, on Whitesboro Street in that city.

The Public Service Commission, Second District, in denying the application of the Central New England Railway Company for consent to execute a mortgage for $20,000,000 upon its property and for authorization to issue bonds upon the security thereof to the amount of $12,910,000, lays down some principles of interest to all public utility corporations. The application submitted was the financial organization plan of the New York, New Haven & Hartford Railroad Company for this property.

The Central New England Railway Company has in outstanding common stock $4,800,000, prefered stock $3,750,000, total $8,550,000. Of this stock the New York, New Haven & Hartford Railroad Company owns common $4,415,395.38, preferred $3,410,376.50, total $7,825,771.88. The New Haven Company by reason of such stock ownership practically owns and controls the Central New England Company. The Central New England Company has outstanding funded and other indebtedness the principal of which amounts to $12,320,500. Of this indebtedness the New Haven Company holds $9,989,123.29 and third parties $2,331,376.71. Among such indebtedness are certain general mortgage income bonds amounting to $7,250,000, of which the New Haven Company owns $6,329,125.29 and other parties $920,876.71. These bonds have been outstanding 10 years and no interest has ever been paid thereon. Another issue of income bonds for which the Central New England Company is liable and which has been outstanding since 1887 and upon which no interest has ever been paid amounts to $1,164,500, of which the New Haven Company owns $1,164,000 and other parties $500. It is proposed to issue interest-bearing bonds bearing 4 per cent in the place of the income bonds owned by the New Haven Company, except said company proposed not to exchange about $1,000,000 of its income bonds for interest-bearing bonds at this time. Other parties have no right under the proposed mortgage to exchange their income bonds for interest-bearing bonds. Certain of the outstanding bonds which the applicant desires to refund have unpaid interest coupons attached to them amounting to $403,283.33. Interest on these coupons from their due date is claimed to amount to $131,377.54. All of these bonds and attached coupons are owned by the New Haven Company and the applicant asks authorization to issue its interest-bearings bonds for the amount of the unpaid coupons and the interest thereon to the amount of $534,660.87. The proposed mortgage, while ostensibly drawn to refund all the outstanding indebtedness of the applicant, is so drawn that no bonds can be issued by the trustee to refund outstanding bonds unless such outstanding bonds are presented by either the applicant or the New Haven Company. This means the New Haven Company only in practical effect since it wholly controls the applicant. The amount of bonds owned by others which cannot be refunded as of right is $2,331,376.71.

In making its decision the commission in a detailed opinion written by Chairman Stevens held: 1. That the applicant is not legally indebted for the interest upon the unpaid coupons. 2. That no sufficient reason has been shown why unpaid interest should be made a capital obligation of the applicant. 3. That a refunding scheme which embraces the securities held by the only creditor and that creditor in control of the applicant through stock ownership cannot be approved. 4. That under all the circumstances of the case the conversion of the income bonds held by the New Haven Company into fixed rate interest-bearing bonds cannot be approved. The last paragraph of the opinion recites that the commission is willing to consider and approve any reasonable plan for the readjustment of the somewhat complicated financial situation of the applicant, but the one submitted possesses features so peculiar that approval cannot be extended to it.

## The Atlantic Cable of 1858.

By William Maver, Jr.

I have read Mr. Charles Bright's letter published in your issue of July 15 relative to my article in your columns on the Atlantic cable of 1858.

I may remark that for reasons not essential to state here, it was necessary to prepare the said article quite hurriedly; in less than four days, in fact, part of which time I was sojourning at the seashore, from which place the manuscript of the article was mailed to the editor, and it was printed within two days thereafter. It is, therefore, apparent that I had not the opportunity to devote as much care to the preparation of the article as I should have desired, nor as I assume Mr. Bright had devoted to his letter, in the writing of which he had allowed himself the best part of a year.

It may be said, however, that this reference to the hasty preparation of the article is chiefly made for reasons that will presently appear. Of course, I recognize that the article in question being limited as to length, and, as I have intimated, to the time of preparation, does not do proper justice to so wide and interesting a subject. There are some features of the article that I myself should now criticise somewhat severely, but in so far as the paragraphs to which Mr. Bright takes particular exception are concerned, they are, in my opinion, well warranted by the facts of the case; and in selecting these paragraphs I think my critic was not happy, as I shall perhaps demonstrate in the course of this reply. It may be interesting to note in passing that one of the aims of the article criticised by Mr. Bright was to point out the important part taken by British engineers and cable manufacturers in the early work of submarine cable laying. No part of the article was intended as an attempt to settle or even to discuss the amount of credit due to the respective engineers concerned in certain parts of that work (a point on which I perceive Mr. Bright is very sensitive), nor to revive the asperities that followed the laying and the immediate utter failure of the Atlantic cable of 1858. But since Mr. Bright has seen fit to reopen the subject, I am quite sure that electrical engineers, and especially telegraph men, of the present generation will read with interest a brief account of some of the salient features connected therewith, and perhaps before I have done there may be occasion to recall the old adage about letting sleeping dogs lie.

Reverting to my critic's letter. Obviously in view of what I have said relative to the haste with which my article went to press, there was no time to submit a proof of it to the writer.

On seeing the article in print, the misspelling of names to which Mr. Bright refers was noticed and occasion was taken to call attention thereto, but the errors were so clearly typographical that it was not deemed worth while to correct them by special notice. The article was, however, subsequently reprinted in *Telegraph Age* (Oct. 16, 1908), and availing of the opportunity afforded thereby, the said typographical errors were corrected in the reprinted article by the writer. As Mr. Bright in his letter called attention to the instances of incorrect spelling of names to show lack of familiarity with my subject, I at first assumed that he had not seen the corrected reprint in *Telegraph Age*, but I now know that he had read the reprinted article and, therefore, I am privileged to assume that Mr. Bright's reference to the incorrect spelling of names as noted was due either to inertness or unfairness. Mr. Bright further states that my article gave evidence of no direct contact with the laying of the Atlantic cable of 1858 on my part. I must plead guilty to that charge, as I was not an infant prodigy; but as Mr. Bright carefully informs us in his writings that his father was knighted by the Lord Lieutenant of Ireland within a few days after the laying of the cable of 1858 when only 26 years of age, it is self-evident that my critic himself could not have had very direct contact with the subject. Such indirect contact as he may have had was, it may easily be supposed, not calculated to make of him an impartial historian or critic relative to more or less disputed questions in which certain persons were concerned, which supposition is well substantiated by Mr. Bright's writings on this subject, some evidence of which I shall produce.

My critic further says in his writings, referring to the honor conferred upon his father for his part in the laying of the cable of 1858: "It was the first title conferred in the telegraph profession, and remained so for many years"; an almost unnecessary sentence, one would think, for at this distance it seems quite evident, in view of the deep mortification following the quick and utter failure of the said cable, that no undue haste would be made subsequently in awarding honors for telegraph work. Possibly it is around this point that the animus of my critic's letter and his treatment of Whitehouse in his writings may be found. It would appear from these writings, especially the later writings, that my critic has set himself the somewhat difficult task of proving that the 1858 cable was practically perfect and fit for lasting operation when laid. Therefore, anything that tends to controvert this view must be frowned upon, to put it mildly, by a self-appointed arbiter. It may be noted that Mr. Whitehouse was the electrician and my critic's honored father was the chief engineer of the Atlantic Telegraph Company of 1857-58.

I said in my article of a year ago that the Atlantic cable of 1858 was to have been laid in 1857, but the attempt to lay it then failed. This led to repeated coiling and uncoiling of the cable from the ships to shore before the cable was laid in 1858, a fact which I omitted to mention in that article. I also omitted to mention the treatment to which the cable was subjected in the process of manufacture in Greenwich, where it was exposed to the heat of the summer sun, "intensified by the tar coating of the cable to 120 deg"; and, as one writer has said, "as might have been foreseen, the gutta percha was melted, so that the conductor which it was desired to insulate was so twisted by the coils that it was left quite bare in numberless places, thus weakening and eventually, when the cable was submerged, destroying the insulation"; nor did I mention the cutting and hacking to which the cable was subjected before its submersion, in the effort to localize and remove defects, evidently without the protest of anyone, and some details of which I shall give when I come to discuss this feature more particularly.

My critic having, as I assume, taken upon himself the task of showing that the cable of 1858 was in operative condition when laid, it appears to have aroused his ire that the present writer should have innocently intimated in his article that possibly the cable of 1858 might have survived the "high tension" of Mr. Whitehouse's induction coils had the cable not been initially defective by reason of the inexperience in cable-making and laying at that time. To refute such a view, Mr. Bright says in his letter: "In the opinion of practically everybody, Whitehouse, the electrician, was alone responsible for the gradual breaking down of the cable by the use of a generating power of immense intensity, in conjunction with the rest of his apparatus." In his "Story of the Atlantic Cable," page 157, my critic says the authorities were unanimous on this point. On page 156 he names Mr. W. T. Henley as one of the authorities. And then he quotes, or rather misquotes, Mr. C. F. Varley as saying unqualifiedly, "Had a more moderate power been used, the cable would still have been capable of transmitting messages." Mr. Varley, however, was not so unfair or so unguarded as to make so unqualified a statement. What he did say in his report on the state of the Atlantic telegraph cable, Sept. 18, 1858, was: *"It is not at all improbable* that the powerful currents from the large induction coils have impaired the insulation, and that had more moderate power," etc. (Italics are mine here and throughout this reply.) This abridged quotation also occurs in my critic's book just mentioned, page 156, hence it is not a slip of the pen.

I may remark here, that after the failure of the Atlantic cable of 1857, a joint committee representing the Board of Trade and the Atlantic Telegraph Company was appointed to inquire into the entire subject of submarine telegraphy. The committee consisted of Messrs. Douglas Galton, C. Wheatstone, William Fairbairn, George P. Bidder, representing the Board of Trade, and of Messrs. Edwin Clark, Cromwell F. Varley, Latimer Clark and George Saward, for the Atlantic Cable Company. This committee continued its sessions for nearly two years and presented a report which has probably never been surpassed for thoroughness and for the value of the information brought out relative to the art of submarine telegraphy. The committee heard the testimony of very nearly all the persons concerned in any way with the Atlantic cable of 1857-58 and inquired particularly into the effect of the Whitehouse induction coils upon the operation of the cable, as subsequent citations herein from the committee's report will show. Mr. Bright in his letter also says that Professor Thomson expressed himself still more strongly than Mr. Varley on the subject of the Whitehouse induction coils. Let us allow Professor Thomson to answer for himself. He was questioned on this point as follows by the Board of Trade committee: "At what distance, in your judgment, did the fault exist, or does it now exist?" "About 300 miles along the cable from the shore end." Question 2551: "Is it your opinion that the electrical state of the cable was made worse by the use of induction coil power or battery power, or either of them?" *"Most probably* it became worse *more rapidly* than it would have done if the fault had been altogether undisturbed. I do not think that the induction coils would produce a worse deteriorating effect on a fault already formed than battery power at 300 miles, for instance." Professor Thomson was also asked, Question 2531: "Then you attribute the failure of the current *immediately after landing* to the defects of insulation which were overcome by the use of more powerful batteries, or more improved means of transmitting the signals either by induction coils or batteries afterwards?" "Yes, and still more by improved means of receiving."

It may be assumed that in his reference to the professor's subsequent statement, Mr. Bright alludes to a qualified remark (in 1860) on this point quoted in Mr. Bright's writings to the effect that Professor Thomson *"had little doubt* that if no induction coil and no battery *power* exceeding 20 Daniell cells had ever been applied to the cable since the landing of its ends, imperfect as it then was, it would now be in full work day and night with no prospect or probability of failure." But it is now obvious that the fearfully imperfect condition of the cable when laid, considered in connection with the history of subsequent events, does not confirm this qualified, optimistic view. For example, in one of his books Mr. Bright says, speaking of the cable of 1865-66 (giant cables as compared with the cable of 1858, and made and laid with all the care that previous sad experience had shown to be necessary). "Unfortunately, both these cables broke down a few months later, and one of them again during the following year. Unlike the 1858 line, however,

these last cables (1865-66) had not been killed electrically, and being worthy of repairs they were maintained for a considerable time." Here, it will be noticed, that in the anxiety to give poor Whitehouse another cut it is unwittingly shown that cables vastly superior in every way to the cable of 1858 could die and did die in a short time without meeting a gradual death by induction coils.

Mr. Bright speaks of the gradual breaking down of the cable in 1858. If breaking down in about three weeks is gradual, so be it. Possibly a remark in Mr. E. B. Bright's "Electric Telegraph," page 120, and another by Mr. Henley, quoted presently, will cast some light on this so-called gradual failure. "As it had been found that the tarry composition coating the outside strand interfered with the speedy detection of faults, by filling up any injury to the gutta percha and by preventing ready penetration of the water in such cases, it was considered better to omit it in the cable of 1866." The 1858 cable was coated with tarred yarn when made and thickly covered with tar when laid.

Mr. Bright, in his writings, I observe, carefully quotes everything that appears favorable to his theory that Whitehouse alone was responsible for the failure of the Atlantic cable of 1858. Quite as carefully, or more so, he hides what practical men have said contrary to that theory. For instance, the writer finds no reference in any of Mr. Bright's writings to the views of Mr. W. T. Henley (one of his authorities), elicited during the Board of Trade investigation. Asked by Mr. Wheatstone if he was of the opinion "that any permanent damage occurred to the cable from employing the very strong induction coils, as some persons think," Mr. Henley replied: "No. It is not my opinion that the induction coils would injure the cable if it was in a sound state." Nor does my critic quote what Mr. Henley said in his report, Sept. 30, 1858, to the chairman and board of directors of the Atlantic Telegraph Company, written from Valentia as a result of Mr. Henley's tests. "In my opinion the fault or faults existed in the cable before it was submerged, and that they would have been detected and made good had the *precaution been observed of having the whole cable* tested in water during its manufacture. Its not showing so bad when first laid is easily accounted for, as it takes some time for the water to soak through the coating of pitch and tar." Neither does my critic quote C. V. Walker, Esq., himself a director of the cable company, I believe, and who had made experiments with Whitehouse at the cable factory and who on being asked, "Do you consider that the cable was injured at all by the strong current sent through by means of the induction coils?" replied, "I have no reason to think so."

It is, by the way, quite singular that notwithstanding his repeated attacks in his writings on Whitehouse, it appears that my critic himself does not really in his heart believe that the 1858 cable was necessarily killed by the Whitehouse induction coils, for in his book, "Submarine Telegraphs," page 54, we find the following rather surprising admission: "It is not improbable that weak joints were the cause of ultimate failure (of the cable of 1858.) A bad metallic joint—i.e., a case of the two ends of the conductor not being properly united—was not a very uncommon occurrence in those days, when no method of joint testing was in vogue. A carelessly effected metallic joint is liable to draw apart on being subjected to a strain during the operation of laying. On the strain being taken off, the ends may join together again temporarily, but under such circumstances the points of contact soon become oxidized and thus all communication gradually ceases. This, together with a gradual percolation of water, is perhaps more likely what took place in the case of the first Atlantic line than any of the explanations for the subsequent cessation of signals. Faults of insulation are scarcely ever of such a character as to account for signals being entirely stopped, and it is never suggested that the cable actually broke."

After this kindly statement by Mr. Bright further pursuit of the subject is almost unnecessary, but it would be a pity to refrain from quoting the verdict of the Board of Trade committee on the failure of the cable of 1858, which is as follows: "We attribute the failure of this enterprise to the original design of the cable having been faulty, owing to the absence of experimental data, to the manufacture having been conducted without proper supervision, and to the *cable not having been handled after manufacture with sufficient care.* We have had before us samples of the bad joints which existed in the cable before it was laid, and we cannot but observe that practical men ought to have known that the cable was defective, and to have been aware of the defects before it was laid." Comment on this finding is unnecessary, except to note that the absence of this verdict verbatim from Mr. Bright's books, so far as I have been able to find, may be considered as very fair testimony that the verdict does not contain anything particularly favorable to his contentions. By the way, my critic's chief witness, Mr. Varley, joined in signing this verdict.

Now, reverting to the Whitehouse induction coils, there is not, it may be remarked, an iota of evidence that the e.m.f. which those coils developed was sufficient to break down the insulation of the gutta-percha insulation of the cable of 1858. At Valentia, Mr. Varley and Mr. Henley both tested samples of gutta-percha insulated wire corresponding, the present writer assumes, to that of the cable, with the Whitehouse induction coils, and in every case the evidence shows it was necessary to prick the gutta-percha with a needle to admit water before the induction coils could force a way through the insulation. Further, Whitehouse used induction coils of high tension in experiments on 2000 miles of underground cable and on the Atlantic cable while it was in process of making, in the presence of and presumably without protest from, the chief, and there is no evidence that, as Whitehouse states, the coils had been found other than harmless. It is noteworthy also that although the members of the Board of Trade committee heard everything that experts concerned had to say unfavorable to the use of the Whitehouse induction coils, they utterly ignored such use as a possible or probable cause of the failure of the cable of 1858. Indeed, all the evidence points to the fact, as the Board of Trade committee's verdict clearly intimates, that the cable of 1858 was in a moribund condition when the Valentia end was handed over to Mr. Whitehouse by the chief engineer. Confirmatory of this, Mr. Saward tells us that he was informed by Captain Kell "that the cable must have been cut into in at least a hundred places at one time or another, and that either from that or some other cause this fearful result has taken place which is exhibited by these four joints which have been cobbled up again," and Captain Kell also in his testimony, on being asked if he thought there might not be faults in the cable when it was laid, other than those he had described, replied, "Yes; quite possible." Mr. Mullaly, who was on the *Niagara,* states, page 267 of his book, that "one part of the cable has been coiled so often that it is bent and twisted to such an extent as to render it difficult to pay it out as fast as the other part, with safety." And more recently, in an article in the Franklin Institute *Journal* (1907), the same gentleman writes: "Hardly, however, had four weeks elapsed before the electrical connections had ceased altogether, the defects which had been the cause of the many delays and difficulties encountered on the different expeditions having not only impaired, but finally destroyed the continuity." Sabine, in his book, says, page 343 (1867): "It (the cable of 1858) was faulty when laid and broke down entirely in three weeks after its submersion." Again, Professor Thomson when testifying before the Board of Trade committee, said (Question 2508): "I had the very strongest misgivings of the cable from the Monday forenoon of the laying," and in an address before the Royal Society of Edinburgh, 1866, said: "And the electrical failure . . . was owing to electric faults existing in the cable before it went to sea." Mr. H. M. Field, in his "Story of the Atlantic Telegraph," page 252 (1866), says: "Take all these things together, and the wonder is not that the cable failed, but that it ever worked at all."

Something of a "consensus of opinion" on the contrary side, it will be observed, and one that rather strongly supports my previous remark as to the moribund condition of the 1858 cable when laid. Somewhat apropos of this the following more or

less analogous incident, which was told to me quite recently by one of the participants, may be related: In some of the hospitals of this country there is an unwritten rule that if the ambulance surgeon brings in a "dead one" to the hospital the penalty is a dinner to the rest of the staff. The efforts made by the ambulance surgeon to avoid this penalty may easily be imagined. Quite recently an ambulance surgeon on responding to a call learned that he had to deal with a bad case of carbolic-acid poisoning. The surgeon found that faint evidence of life still lingered in the patient, hence he was hurriedly placed in the ambulance and the driver urged his horses with all speed toward the hospital, the surgeon meanwhile, as a last resort, vigorously practising artificial respiration on the patient. Reaching the hospital, the moribund body was placed on a bed. The patient gave a gasp. "Did you hear him breathe?" said the surgeon to the nurse. "Certainly, doctor," was the reply, whereupon the surgeon made hurried exit to the corridor to take the elevator to his office down stairs. Unfortunately, the elevator did not come immediately, and while the surgeon was waiting the nurse came forward, saying, "Doctor, you had better return and pronounce him dead." It is within the possibilities that nurse Whitehouse, although he had heard the patient gasp, would have been glad to have made a similar request had the surgeon in the case been accessible.

Mr. Bright also criticises my reference to the more or less crude methods of paying out the Atlantic cable of 1858, which, together with the inexperience in cable-making, I had timidly suggested may have been sufficient to account for the cause and development of the faults. And Mr. Bright inquires if the writer is not aware that the methods of paying out the cable of 1858 are still in every-day use in all essential particulars. Any tyro, of course, knows that the underlying principles of the paying-out apparatus employed on the *Niagara* and *Agememnon* in 1858, as recommended by Messrs. T. Lloyd, Joshua Field and John Penn, Englishmen, and Mr. W. E. Everett, the American engineer, in their joint report on the subject to the cable company (and to which I shall refer at length subsequently), are still followed in cable laying. But not even a tyro should be expected to father the statement that the present methods of laying submarine cables are as crude in all respects as they were in 1858. The writer said "more or less" crude methods. Because of the fair weather enjoyed by the *Niagara* the methods were "less crude" and the paying-out machinery worked beautifully, while no doubt mainly because of the tempestuous weather met with by the gallant *Agamemnon*, the methods were "more crude." The machinery did not work so well on that ship. It stopped at times, and the log teems with items like the following: "Hands stationed helping brake wheels round"; "heavy sea on, men continuously in attendance to turn brake wheels"; "men, as on previous watch, stationed to turn drums," etc.

But we may now hear from some of the engineers concerned and others. For example, relative to this subject, in the hearing before the Board of Trade committee, the chief engineer was asked: "Did you observe any mechanical defects in the paying out?" He replied: "I think the machine should be made a little lighter another time." His assistant, Mr. Canning, was asked: "Have you any observations to offer to the committee upon the paying out of the cable or the brake machinery?" "As far as we saw it, on board the *Agamemnon*, it acted very well certainly; we should now make some alterations or we should not use the same apparatus again." Well might Canning say, "As we saw it on board the *Agamemnon*." In view of the many anxious hours, during which, because of the terrible storms encountered by that ship, it may easily be surmised they probably did not see it at all. And Staff Commander H. A. Moriarty, in the *Journal* of the United Service Commission in 1867, said: "This arrangement (of 1858) of machinery is very powerful for retarding the egress of the cable, and well adapted to a uniform strain, but it has too much inertia to meet the exigencies of strains and speed ever varying. *Manual effort was frequently employed* (1858) when the strain was light (on the *Agamemnon* only, however). The machine employed for the same purpose in 1865 was very different." So much for the more or less crude methods.

But why my critic's gratuitous fling at Mr. C. F. Field, where he says that when Field came over to England "his ideas had all been preceded by Brett and my father?" Because, perhaps, his father, in common with numerous other men in Europe and America, had suggested that transatlantic telegraphy was within the range of possibility. Indeed, it would seem that my critic resents Mr. Field's appearance on the scene as an intrusion that deprived certain other gentlemen of first honors in Atlantic cable telegraphy. But let us have some testimony on this point from a gentleman whose competency to express an opinion on this question of priority will hardly be disputed even by my critic. The reference is to Mr. George Saward, secretary of the Atlantic Telegraph Company, who, asked by the chairman of the Board of Trade committee to kindly describe the origin of the Atlantic Telegraph Company and the arrangements under which the first proceedings took place, replied: "The Atlantic Telegraph Company sprang out of a scheme for shortening the time of communication between the United States and Europe, which was originated in 1851 by a Mr. Tibbetts, of New York, in conjunction with Mr. F. N. Gisborne, an English engineer." This resulted in the formation of the Newfoundland Electric Telegraph Company, which company proposed to establish land and submarine lines of telegraph from St. Johns, N. F., to the Gut of Canso. That company failed financially. In 1853 Mr. Gisborne visited New York and met Mr. Field. "It happened that some time previously to this period the idea of establishing a telegraph across the Atlantic had suggested itself to several individual minds, but it *had assumed no form or substance*, and Mr. Field, though unwilling to apply his private means to propping up the falling fortunes of the Newfoundland Telegraph Company by promoting that scheme as an isolated venture, conceived the notion of obtaining scientific advice upon the subject of a transatlantic telegraph from his distinguished countrymen, Lieutenant Maury and Professor Morse. Their assurances were satisfactory." The result was that a company was formed consisting of six American citizens, and termed the New York, Newfoundland & London Telegraph Company, the object of which was to bring London and New York into continuous electric communication. "This company, established as I have described, having executed its work in the island, turned its attention toward extending the telegraph to Europe. It was found impractical to raise the capital for this part of the undertaking in America, and Mr. C. W. Field, during one of his early visits to England, associated himself with Mr. J. W. Brett with a view to the money being raised in England. Mr. Brett, who was then a good deal occupied with other cables, employed Mr. Whitehouse, whom he knew as an electrical experimenter, to investigate for him some electrical facts in connection with the probabilities of success. Mr. Whitehouse, in the course of these experiments, became acquainted with Sir Charles Bright, and finally these four gentlemen, Messrs. Field, Brett, Whitehouse and Bright, entered into a contract with each other to become joint projectors of a separate company in England to carry out the submarine line between Ireland and Newfoundland," etc.

This statement by Mr. Saward puts the American claims for Mr. C. W. Field's part in transatlantic telegraphy in terse shape. Mr. Field gave *form* and *substance* to what had hitherto been merely a dream. As Mr. Whitehouse said before the Board of Trade committee, Mr. Field was the "active" man, and while there is no doubt that transatlantic telegraphy would eventually have been accomplished had Mr. Field never taken part in the work, the fact remains that it was he who, by his untiring efforts, advanced its accomplishment by many years; and despite the flings of cavilers, the name of Cyrus W. Field will, in the words of Mr. George Saward, "go onward to immortality as long as that of the Atlantic telegraph shall be known to mankind." The fact that Mr. C. T. Bright was one of the four original "projectors" of the Atlantic cable of 1858 is so well known that one wonders what my critic has in mind when he so solemnly assures us that he has in his possession the orig-

inal agreement between the four gentlemen. Of course, no one will question that Mr. Brett had early practical conceptions of the feasibility of transatlantic telegraphy, and even went so far as to *register* in 1846 a scheme for connecting Ireland and Nova Scotia by telegraph, but Mr. Saward's statement as to "form and substance" still stands; and Mr. Brett himself has written in his "Origin and Progress of the Ocean Electric Telegraph" (August, 1858): "To my coadjutor, Mr. Field, too much praise cannot be given; his untiring energy has united and brought about the invaluable co-operation of the United States and Colonial Governments to the support of the enterprise."

I notice also Mr. Bright's allusion to the fact that I did not in my article specifically differentiate between the civil engineers and the electrical engineers engaged in early cable work. In Great Britain and in this country electricians employed in electrical work of a high order are included in the generic term electrical engineers, as evidenced by the names of the electrical engineering institutes in both countries. To term a man an electrician in this country is usually to dub him a dynamo tender or an electrical wire worker. With this explanation, my inclusion of Whitehouse, Latimer Clark, Thomson and Varley as engineers is clear. I had previously referred to Varley as the electrician of the company, and to Henley as the telegraph engineer; and in general the writer may modestly remark that his opportunities to distinguish between the various grades of electrical engineers have very likely equaled, if not exceeded, those enjoyed by his self-appointed critic.

I confess, however, I was somewhat derelict in not taking time in my article of last year to give at least passing notice to the admirable service rendered by the American engineer, Mr. W. E. Everett, under whose supervision the cable-paying-out machinery was made and installed, and who was in *sole and responsible* charge on the *Niagara* of the successful laying of one-half of the cable of 1858. But, in fact, as may plainly be seen by a perusal of the article, there was no intention to make particular mention of or to detract from the credit due to individuals concerned in the enterprise. Still I now find it difficult to excuse the failure to make mention in any way in my article of Mr. Everett's great part in that work and I shall here endeavor to make some small amends. In doing this, I may incidentally also disclose what seems like an attempt on the part of my critic to deprive Mr. Everett of the great credit due him for his participation in this work. Thus I find my critic concurring in saying, as joint author of the "Life of Sir C. T. Bright," on page 204 of that comparatively recent book, and repeating almost verbatim on page 77 of a new edition of that book (1908), revised and abridged exclusively by my critic, as follows: "A committee was arranged to confer with Charles Bright as to the machinery, consisting of Messrs. Lloyd, Penn and J. Field. Mr. W. E. Everett *was also consulted later*. . . . He also joined in approving Charles Bright's suggested alterations. This gentleman had to return to America with his ship, but on again arriving in London on Jan. 18 (1858) he had the satisfaction of attesting to the sterling qualities of *the machine devised, adopted and constructed in his absence*, as well as in *partly superintending* the setting up of it aboard the ships. The above committee reported (Sept. 17, 1857): We consider the paying out *sheaves* require no alteration, except those suggested by Mr. Bright in a memorandum he was good enough to place in our hands. Quite independently, however, Charles Bright had decided that the checking gear or brake should not be left in the power of any person in charge to jam the machine. Subsequently a very opportune invention of Mr. J. G. Appold, F.R.S., was suggested . . . Which is all very interesting, indeed, in view of what appears to be the facts in the case.

Let us first take up the statement relative to the alleged construction of the paying-out machinery in Mr. Everett's absence, apropos of which Mr. Mullaly, who accompanied both expeditions (1857-58) on the *Niagara*, has this to say, on page 172 of his well-known book, published immediately after the events: "Mr. Field and Mr. Everett arrived in London (about Jan. 18, 1858). They found that nothing had yet been done toward making the experiments preliminary to the adoption of the required form of machine for paying out the cable, although it had been explicitly understood before Mr. Everett's departure from England that the experiments would be announced to him on his arrival. Nothing, however, as we have said, had been done, and he was obliged himself to enter upon the experiments, the results of which *were of consequence* . . . working night and day until the apparatus was constructed, whereupon Mr. Everett reported to the directors the results and received the following letter from Mr. Saward, secretary of the company: "London, April 24, 1858. To E. W. Everett, London: Dear Sir—As *you* have now reported to the managing committee that the paying-out machinery for H. M. Ship *Agamemnon* is completed, and that it has been working satisfactorily during the last three days, and that *you* do not consider any alteration necessary to increase its efficiency, and as another set is required for the United States frigate *Niagara*, the managing committee have authorized and instructed me to request that you will immediately give directions to Messrs. Easton and Amos to put another set in hand for that ship; and I am further to request that you *will continue your supervision over the construction of the machinery*, and also undertake to superintend and direct its being properly fixed and fitted on board the *Niagara*. I am further instructed to *request*, that *you* will take charge of the operation of experimenting upon, and subsequently of paying out the cable from that ship; in doing which you will have the co-operation of Messrs. Woodhouse, Follansbee and of such assistant engineers as you may consider it requisite to appropriate to such service. You are also authorized to make such preparations and arrangements as are necessary to enable you to carry out the foregoing instruction."

The following remarks from a letter to the directors of the company from Mr. C. T. Bright, under date of April 24, 1858, is also of some interest in this relation: "Gentlemen—Since the report which I made to you *in conjunction with Mr. Everett*, of the 6th inst. (April, 1858), in regard to the paying-out machinery and the results of the experiments relating thereto, *a complete machine has been erected* at the works of Messrs. Easton and Amos . . ." It will be noted that the quotation cited from the "Life of Sir C. T. Bright" has this machinery all made before Jan. 18, 1858, and only allows Mr. Everett a partial share in the setting up of the machinery aboard the ships.

A few words relative to the committee "arranged to confer with Charles Bright" may now be in order. It will be remembered by the readers of the literature of this subject that Mr. C. W. Field also sailed on the *Niagara* on the unsuccessful expedition of 1857. There Mr. Field had met Mr. Everett, and the former gentleman, with his usual acumen, had no doubt recognized in Mr. Everett a young man of parts. On the failure of the expedition of 1857, Mr. C. W. Field had requested Mr. Everett to undertake the work of devising new paying-out machinery for the next expedition (1858), the machinery devised for the first expedition having proved insufficient, and Mr. Field obtained leave of absence from the United States Government for Mr. Everett to enable him to undertake this work (see Mullaly's book, page 172). Mr. Everett in 1857 obtained the co-operation of Messrs. Lloyd, Penn and J. Field, of London, and with them presented a report (mentioned in the quotation cited from the "Life of Sir C. T. Bright") to the managing directors (Mullaly, page 157), from which report the following brief abstract is here made: "London, September, 1857. Gentlemen—Having examined, agreeably to your request, the apparatus and arrangements on board the *Niagara* for paying out the Atlantic telegraph cable, and given the whole subject our careful consideration, we beg to lay before you the conclusions at which we have arrived. We consider the paying-out sheaves require no alteration except those suggested by Mr Bright in a memorandum which he was good enough to place in our hands, a copy of which we append. (Here follow the suggestions.) The most important consideration, however, to which we have directed our attention is how to guard against the strain being brought on the cable while paying out, greater than it is capable of bearing without risk of damage . . .

The means which we recommend for this purpose are the substitution for the present brakes of two others . . . They should be constructed on the plan patented some years ago by Mr. Appold . . . (Signed) T. Lloyd, Joshua Field, John Penn, W. E. Everett."

It may be observed here that the "subsequent suggestion" of the Appold device mentioned in the quotation from the earlier edition of "The Life of Sir C. T. Bright" occurs in the paragraph of the committee's report immediately following the one relative to sheaves, cited in the same quotation. Notwithstanding that, I am aware my critic has said in one of his books that this subject is treated from the American standpoint by Mr. Mullaly, I am compelled to quote that gentleman for the simple reason that I do not find either the committee's report or the very important letters of Mr. Saward and C. T. Bright in my critic's accurate resumé of the subject, or in any of his other writings. I trust I have not overlooked them. However, the ordinary reader will probably agree that Mr. Mullaly's statement of the facts accords quite nicely with the facts as given in the English letters and report just mentioned, all of which facts tend to show very conclusively Mr. Everett's exceedingly important part in the work of laying the Atlantic cable of 1858, to say nothing of the important bearing of that work on all subsequent submarine cable laying. It is, by the way, noteworthy that no one on Mr. Everett's part has ever deemed it necessary to endeavor to throw the blame of the failure of the cable, in which he bore so prominent a share in laying, on the shoulders of Mr. Whitehouse.

I concede that in the last paragraph of my article I was not perhaps sufficiently discriminating in classing all engineers (civil and electrical) together as worthy of equal credit. I should have differentiated more clearly, for instance, between those engineers who had merely laid or assisted in laying and operating one or more cables, and those, like Thomson and Varley, whose early work made possible the successful operation of all submarine cables for all time.

In closing, I may notice my critic's allusion, in his letter to the *Electrical World,* to his work on "Submarine Telegraphy" as containing an accurate resumé of the history of that art. As my critic thus invites criticism of the accuracy of his statements, I would point out what appears to be a rather important error on his part, unless he can prove from his alleged sources of "exclusive information" that the gentlemen whom I shall quote are themselves in error. Thus, on page 52 of that book, Mr. Bright says: "It (the cable of 1858) had only been subjected to battery currents derived from *about 70 ordinary Daniell cells, by which all* signals were interchanged between the ships." On this point, Professor Thomson testified, in answer to questions 2494 and 2498, before the Board of Trade committee, referring to the nature and power of the battery employed on shipboard, that "The common sand, zinc and copper battery, with sawdust substituted for sand, was the battery which was used . . . During the greater part of the process in laying the cable 20 *twelves* of the battery described was the battery used." And Mr. Mullaly, who, as already stated, was on the *Niagara* on both expeditions, in his book, says, page 252, that 240 pairs of zinc-copper cells were employed on each ship. Quite a discrepancy.

On the whole, I account myself rather fortunate that my impressions concerning the matters under discussion herein were formed long before Mr. Bright's books were written, and from sources quite authentic, although not necessarily "exclusive." I have thus probably been safeguarded from falling into accord with certain views that my critic has striven somewhat assiduously to promulgate in his writings, and some of which I have touched upon in the preceding remarks. I rather regret that time will not permit picking up my critic on the matter of his reference to my "favorite" Varley. That pleasure may be reserved for another occasion.

I trust it will not be hastily concluded that the foregoing statement of facts exhausts the subject; on the contrary, the surface has as yet scarcely been scratched.

## CURRENT NEWS AND NOTES.

*WIRELESS STANDARDIZATION.*—The Wireless Institute has appointed a committee to provide rules for wireless telegraph standardization similar to the standardization rules of the American Institute of Electrical Engineers.

*SUBMARINE TELEPHONY.*—The British Government has decided to lay a telephone cable equipped with Pupin coils across the English Channel to be connected with the land lines at Dover and Calais in order to improve the communication between London and Paris.

*EDUCATION OF EMPLOYEES.*—The Dayton (Ohio) Lighting Company has formed a night study class for instructing its employees on electric subjects. Mr. Oscar Reemelin, superintendent of the underground department at the plant, has been elected chairman, and Mr. A. Larney secretary and treasurer. The latest patents and appliances will be taken up and studied.

*CONNECTICUT PUBLIC UTILITIES.*—The public utilities bills drafted by a special committee of the Connecticut Legislature providing for a public utilities commission have been defeated by a vote in favor of indefinite postponement. The opponents of the bills claimed that the bills as drawn up would make conditions in the State worse under a commission than they are at present with no commission.

*MONOPOLY OF UTILITIES.*—Mr. E. M. Bassett, of the New York City Public Service Commission, has returned from an inspection of traction systems in Cleveland, Toledo, Buffalo, Niagara Falls, Toronto, Detroit, Chicago, Milwaukee, St. Paul, and Minneapolis, and expresses himself as a result strongly in favor of well-regulated monopolies in city transportation under a system of "indeterminate" franchises. He believes this best for the public welfare and benefit.

*TELEPHONIC TRAIN DISPATCHING.*—Many of the leading steam railroads are arranging to employ telephones for train dispatching. The Norfolk & Western will equip its entire main line, 710 miles in length, with telephones. The Northern Pacific, which now has in service 470 miles, will install 250 more immediately. When the contemplated installation of 200 miles, in addition to the present equipment of 250 miles, has been made on the Michigan Central, the New York Central will have 1000 miles of its system under telephonic control.

*LITIGATION AGAINST ELECTRIC SIGNS.*—The prosecuting attorney of South Bend, Ind., has filed action against a number of merchants charging them with violation of the State law in the erection of overhanging electric signs. His charges apply to illuminated arches and all electric devices extending over the sidewalk. As these alleged unlawful electric signs represent an expenditure of thousands of dollars the action of the courts, if unfavorable, will probably have an effect throughout the State.

*INDIANA WATER-POWERS.*—Mr. W. S. Blatchley, State Geologist, of Indiana, who has been surveying and investigating the water-powers on the various streams of Indiana, says the State of Indiana should assert control over the water-power of the rivers of the State and prevent their ownership by private interests. The Attorney-General has declined to give an opinion as to whether the State has power to assume control of the streams for power purposes, but admits the importance of doing so if possible. Indiana has a number of power-producing streams and their development is only a matter of a short time.

*A LAMP IN BED.*—An incandescent lamp left on a bed in a residence in Portland, Ind., at a time when the current was off the lines, fired the bed and building when current was later turned on the lines.

*WIRELESS INSTITUTE MEETING.*—At the next regular meeting of the Wireless Institute, to be held in the Engineering Societies Building, New York, Sept. 1, Mr. Harry Shoemaker will present a paper entitled "The Production of High-Frequency Oscillations."

*SIXTY-CENT GAS IN INDIANAPOLIS.*—Residents of Indianapolis are supplied with manufactured gas for both illumination and fuel at the low rate of 60 cents per 1000 cu. ft. There are two companies, and the rate is the result of a legislative enactment. The older company declares the rate is confiscatory, and it is not unlikely that the legality of the 60-cent rate will be tested in the courts.

*CREOSOTING AS PROTECTION AGAINST BIRDS.*—The United States Forest Service has called attention to the damage to telephone, telegraph and electric lamp poles inflicted by birds of the woodpecker family. The Service is investigating the protection afforded by creosoting. It has been observed in Louisiana that poles which had been impregnated with creosote oil were not attacked by the birds, whereas untreated poles under the same conditions were very severely injured.

*METAL CORROSION.*—The Carnegie Library of Pittsburgh has just issued a second edition of a classified series of references to metal corrosion and protection. The pamphlet was first issued in 1906 and has been in constant demand ever since. The revision has been made by Mr. Walter C. Holmes, of the Technology Department, and comes up to as recent a date as July 1, 1909. The references to electrolysis are very numerous and useful as well as to such subjects as galvanizing and tinning. The pamphlet is published at a price of 10 cents, postage prepaid.

*FEDERAL CORPORATE TAXATION.*—The third international conference on State and local taxation will be held at Louisville, Ky., Sept. 21 to 24, when several important questions will be brought up, and resolutions will be offered against Federal taxation of corporations. A resolution will also be submitted approving the proposed amendment to the Constitution on the subject of a Federal income tax, applicable to all income. The conference is held under the auspices of the International Tax Association, of which Mr. A. R. Foote, of Columbus, Ohio, is president. A letter of invitation to Governors of States has been sent out by Governor Willson, of Kentucky. At the last conference, in 1908, no fewer than 24 States, 5 Canadian provinces and 18 universities and colleges were represented by delegates.

*ELECTRICAL ASSISTANTS.*—The United States Civil Service Commission announces an examination on Sept. 29, 1909, to secure eligibles from which to make certification to fill two or more vacancies in the position of electrical assistant in the Signal Service at Large, War Department, at $1,080 per annum. Applicants, who must be thoroughly familiar with the practical side of electricity as applied to telegraph, telephone and cable engineering, and also with the methods of testing and installing electrical instruments used in fire control, such as storage batteries, motor generators, power and telephone switchboards, wireless telegraph apparatus, telegraphs, electric clocks, telephones, etc., should apply at once to the United States Civil Service Commission, Washington, D. C., for application Form 1312.

*ELECTRICAL SECTION OF WESTERN SOCIETY OF ENGINEERS.*—Among the papers announced for the coming fall and winter season of the Western Society of Engineers, Chicago, are three bearing the following titles: "Economies in Central-Station Management," by Mr. W. L. Abbott, chief operating engineer of the Commonwealth Edison Company; "Depreciation and Reserve Fund for Electric Properties," by Mr. William B. Jackson, consulting engineer, Chicago; "New Illuminants," by Mr. Carl Wiler, Western Electric Company. These papers will probably be read before the electrical section of the society, the first meeting of which, for the season, will be held probably on Oct. 15.

*MEXICAN TELEGRAPHS.*—All telegraph lines in Mexico are controlled by the Government, and there is a network which covers the Republic. The service is rapid and accurate, and there has been a great improvement in recent years, largely owing to the unceasing efforts of Mr. Camilo A. Gonzales, Director-General of Telegraphs for the Federal Government. The Morse alphabet is used with a few changes to make it conform to the alphabet of the Spanish language, which is slightly different from the English alphabet. The rates are somewhat lower than in the United States, and the operators are nearly all men. Quadruplex and duplex instruments are used on the more important trunk lines, and the Government is considering the installation of printing telegraphs in the larger cities.

*STREET-RAILWAY STRIKE IN CHICAGO APPARENTLY AVERTED.*—In an effort to secure increased wages the employees of the Chicago Railways Company, Chicago City Railway Company and allied companies, nearly 10,000 in number, voted to strike nearly two weeks ago. But active negotiations were at once begun by representatives of the companies and unions, with the benevolent assistance of Mr. Walter L. Fisher, representing the city, which is actively interested because it receives 55 per cent of the net profits of operation. Happily, an agreement was reached on Aug. 13, which is apparently acceptable to both sides. The men will receive a satisfactory increase in wages, but not in accordance with the schedule of their original demand. A contract will be entered into, under the compromise plan, to run 3½ years from Aug. 1, 1909. To all old men who have served one year at 27 cents an hour—the old maximum scale—it will grant an immediate increase to 28 cents for the first year of the contract, 29 cents for the second year and 30 cents for the last 18 months. Other men will progress to the maximum more slowly.

*RECOVERY FROM 15,000-VOLT SHOCK.*—Professor Henry G. Gale of the department of physics, University of Chicago, was the victim of a very serious accident on March 19 at Pasadena, Cal., from the effects of which he has not yet entirely recovered. At the time of the accident Professor Gale was working with a 5-kw transformer in the laboratory of the Mt. Wilson Solar Observatory at Pasadena. The transformer was adjusted to give about 15,000 volts in the secondary, with about 20 amp at 110 volts flowing in the primary circuit. The high-potential current was used as a source of spark spectra under pressure, which were under experiment. In some manner Professor Gale, who was alone at the time, came in contact with the 15,000-volt circuit in adjusting some self-induction in that circuit. The shock rendered him unconscious and threw him violently to the floor and some distance away so that his body came in contact with the rheostat in the primary circuit. This rheostat is made of strips of sheet-iron on a wooden frame, and in falling upon it Professor Gale received very severe burns from the hot metal. How long this contact lasted is not known, for when the injured man was discovered by Professor Hale of the observatory, about half an hour after the accident, he had rolled away from the rheostat. For 24 hours after the accident Professor Gale was practically unconscious, and he was delirious for much of that time. He was removed to a hospital in Pasadena, and it was discovered that there were over 20 burns on his body, some of them very deep. He recovered from the electric shock within a few days, but the burns were slow in healing, and it was not until late in June that he was removed to his home in Chicago, and he is still confined to the house.

# The Electrical Equipment of the Mutual Benefit Life Building of Newark, N. J.

BY N. M. SCHOONMAKER.

ONE of the characteristics of the buildings put up by insurance companies is their perfection and elaborateness of detail. The Mutual Benefit Life Building, of Newark, N. J., is no exception to this rule. It is a building upon which was spared no expense that would add to its beauty or efficiency. Facing on Broad Street, with 100 ft. frontage, it runs back 188 ft. on Clinton Street, with a wing that extends back through to Commerce Street. The main building, seven stories high, is of white marble. A public corridor, the common entrance, divides the first floor, the Clinton Street section being occupied by a bank and the opposite section by the department of insurance.

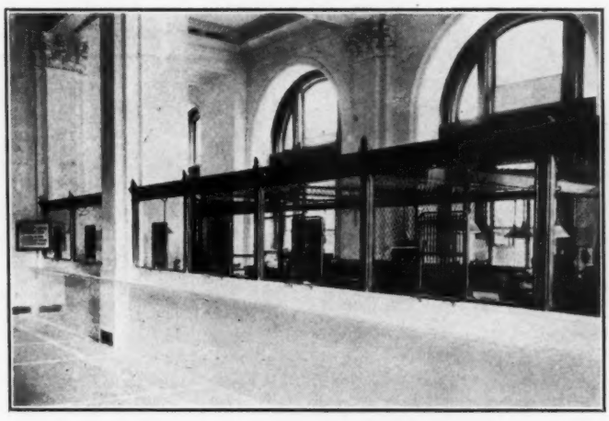


FIG. 1.—SCREEN LIGHTING IN BANKING OFFICE ON MAIN FLOOR.

In order to give more floor space to the bank, a mezzanine was constructed in the rear of the first floor of the Clinton Street section, which the bank uses for directors' room, etc. The basement beneath this section was also adapted to the bank's requirements. It is shut off from the remainder of the basement, and has but one exit, through a barred door into the rear of the public space of the bank. Inside of the barred grille work, in this section of the basement, which surrounds the vault, is also the coin-lift which exits above inside the paying teller's screen. Outside of this barred space the bank basement is used for storage of books, records, etc.

FIG. 2.—METHOD OF LIGHTING DESKS IN ACTUARIAL DEPARTMENT ON SEVENTH FLOOR.

The basement under the entire remainder of the building is connected, one section being occupied by the heating and ventilating plant, pumps, tanks, etc., for the elevators, and a considerable space being set aside for locker- and toilet-rooms to be used in common by the bank and by the department of insurance. This basement space has two sidewalk lifts. Views of the motor-driven apparatus in this part of the building are shown in Figs. 4 and 11.

The department of insurance occupies the first floor of the section across the public corridor from the bank and also all the upper stories, which latter are used for clerk space, filing-rooms, etc. A book vault, extending from the first floor and constructed with two or three mezzanines to each story height, runs up through all other stories except the sixth. The main burglar-proof vault is on the second floor. The sixth floor, which is used for filing space, has no windows opening upon the street. The sixth and seventh floors of the old Commerce Street wing were remodeled into a kitchen and dining-room for the officers and clerks of the insurance company. The company's old building was on this same site and, as it did not wish to find new quarters elsewhere while the new building was in process of construction, it was decided to put the new building up in sections. The company was crowded into the part of the old building which lay along Clinton Street while the opposite section was erected and made ready for occupancy. They then moved into that, and the Clinton Street section was built. And last of all, the Commerce Street section was remodeled, the lower floors of it being left as they were, except that the boiler plant and other such equipment were increased.

FIG. 3.—DESK FIXTURES IN FINANCE DEPARTMENT.

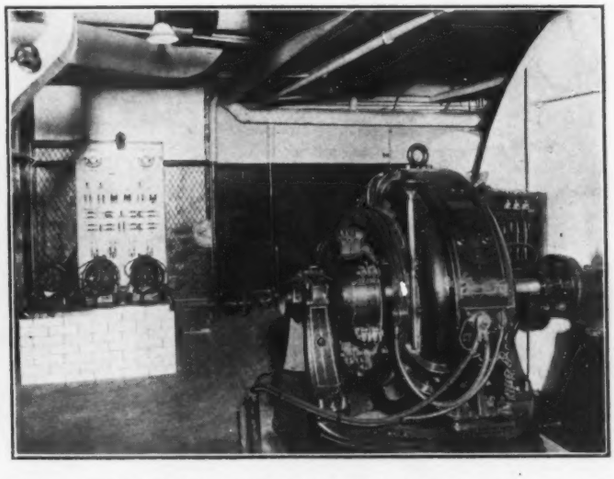


FIG. 4.—MOTOR-DRIVEN VENTILATING FANS AND LOW VOLTAGE SETS FOR RINGING CIRCUITS.

The basement for the entire new building was built before the above-ground work was begun and before any part of the old building was torn down. The supporting columns for the new building were there laid out so as to secure the two sections separately.

All these peculiarities in construction and conditions of construction had, of course, to be taken account of in the plans for the electric wiring of the building. To begin with, a temporary lighting service had to be installed for the section that was built first, this being eventually taken out and replaced by the permanent service. In this temporary system weatherproof wire was used and the work was run exposed.

Many parts of the building required special work. The sixth floor (Fig. 9), in which there are no outside windows, and which is used for filing space, depends entirely upon artificial light. The number of desks in the upper floors of the building, each one of which must be provided with a desk lamp (Fig. 2), also made a great deal of special work necessary. There is an unusually elaborate system of call bells. The wiring in the bank screens is run in specially designed cornices with outlet boxes made to correspond. More than this, there are two kinds of service, the lighting being 230-volt, three-wire, alternating current and the power 525-volt direct current, this voltage necessitating the best of insulation. The permanent service enters the basement from Clinton Street, drops through the floor and runs on the ceiling of the cellar to the switchboard.

Ordinarily the service company will put in the service-board, but desiring to keep the standard of the whole construction up to a very high level, the engineers provided for two special service-boards, to be put in by the electrical contractor. These are set in a service vault at the service entrance, just off the locker-room, with double-throw switches so that in case of a blow-out one side can be fused while the other side is in use. They are constructed like switchboards, with all busbar work on the back, and have the light and power meters mounted on them.

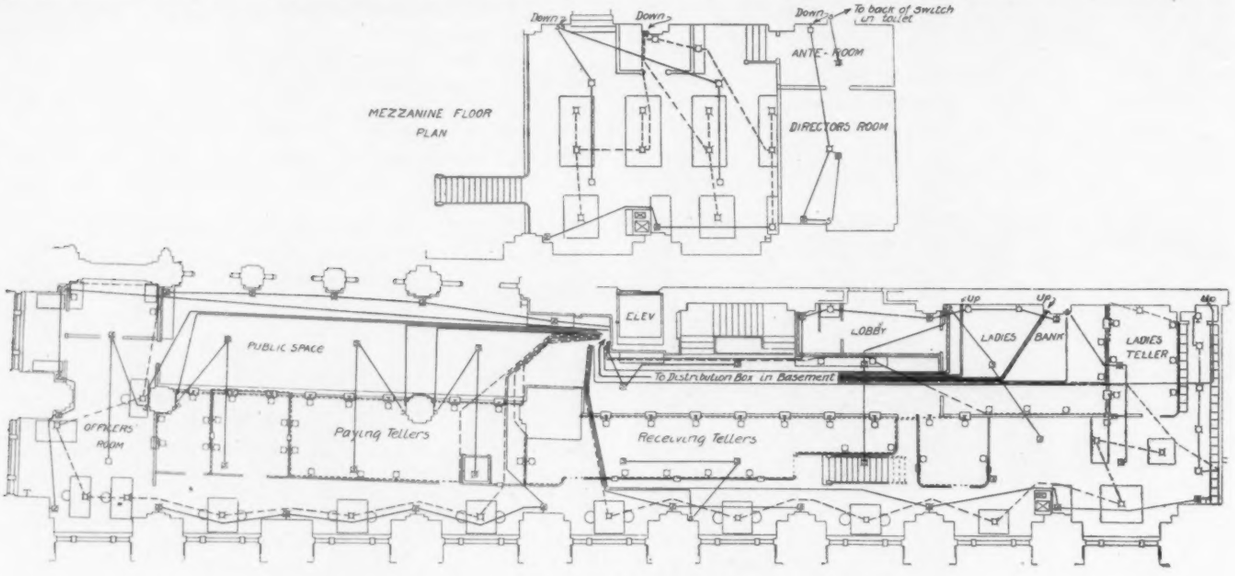



FIG. 5.—ELECTRIC CIRCUITS ON FIRST AND MEZZANINE FLOORS.

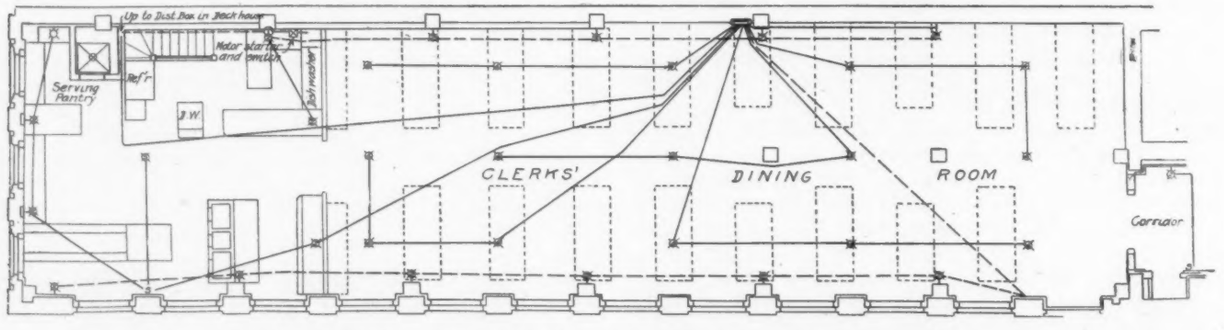



FIG. 6.—CIRCUITS IN GENERAL DINING ROOM ON FIFTH FLOOR.

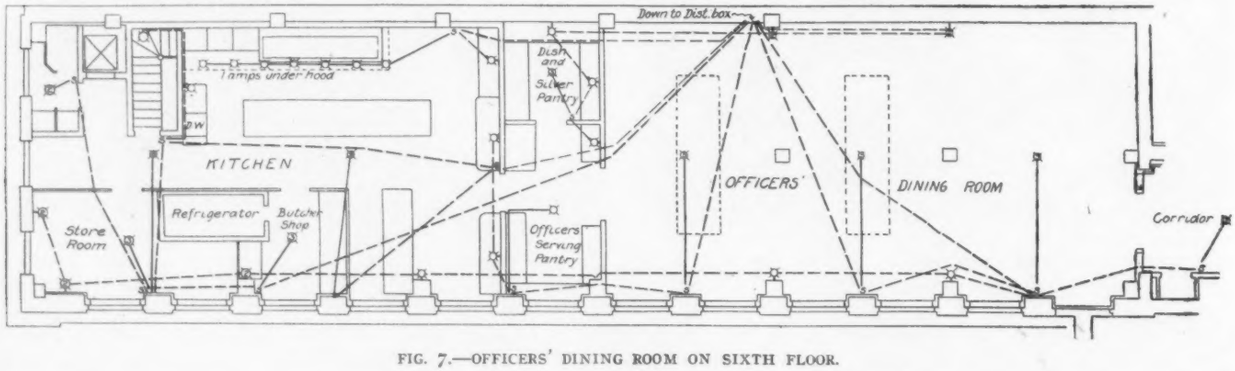



FIG. 7.—OFFICERS' DINING ROOM ON SIXTH FLOOR.

The switchboard is located in the basement. It is 8 ft. long, 6 ft. 6 in. high, of white Vermont marble 1½ in. thick, and is supported on an angle-iron frame resting on bronze pedestals. It is made up in two slabs, one for light and one for power. The front of the board is surrounded by a plain polished-copper molding, the space around the completed board being filled in with bronzed grille work, extending above from the top of the board to the ceiling and at the ends from the board to the wall. The switches, knife pattern with enclosed fuses, are all-copper and the busbar construction on the back of the board is of copper. The large lugs are specified to take a length of cable equal to 2½ times their diameter. The switches are mounted on the power section of the board for each individual motor and each power center of distribution, and on the lighting switchboard for each lighting feeder as indicated by the feeder diagram (Fig. 8).

The feeders run to the bottom of the switchboard in the shape of hard-drawn copper rods covered with neatly fitting circular-loom conduit and supported by porcelain insulators fastened to angle-iron frame. These rods, which are of the same size as the cables, no rod being less than ¼ in. in diameter, are secured to the cables by means of Dossert mechanical couplings.

From the switchboard the feeders run to centers of distribution, to distribution boxes, or to motor outlets. At centers of distribution, the feeders join the mains through knife switches. They are run in exposed conduit on the cellar ceiling to their riser points and thence in chases up to their destinations. The number, size, route, system, etc., are shown by the following tables:

MOTOR FEEDERS.

| No. | Location. | Motors. | Horse-Power. | Size. |
|---|---|---|---|---|
| 8..... | Cellar | Motor Generator. | | |
| 9..... | Basement | Vault Blower. | 6 | No. 8 B.&S. |
| 10..... | Basement | Broad St. Blower. | 20 | No. 2 B.&S. |
| 11..... | Basement | Engine Room Exhaust. | 30 | No. 0 B.&S. |
| 12..... | Basement | Filter Cleaner. | 3 | No. 10 B.&S. |
| 13..... | Basement | Engine Room Blower. | 20 | No. 2 B.&S. |
| 14..... | Basement | Clinton St. Blower. | 12 | No. 6 B.&S. |
| 15..... | Basement | Small Elevator Pump. | | No. 0 |
| 16..... | Basement | Elevator Pump. | | No. 0000 |
| 17..... | Basement | Elevator Pump. | | No. 0000 |
| 18..... | Roof | Roof Power. | 62 | 300,000 circ. mil |
| 19..... | Basement | Air Compressor. | 2 | No. 10 |
| 20..... | Basement | Commerce St. Wing Power. | | No. 00 |

LAMP FEEDERS.

| No. | Feeds. | Lamps. | Dis. Box. | Size. |
|---|---|---|---|---|
| 1. | Commerce St., Wing Lamps... | | | No. 0000 |
| 2. | Basement and Cellar Lamps... | 146 | | No. 4 |
| 3. | 1st, 2d, 3d and 4th Fl. Lts., Shaft No. 1..... | 597 | 3, 5, 7, 9, 11. | No. 0000 |
| 4. | 5th, 6th, 7th, Fl. Lts., Shaft No. 1..... | 790 | 13, 15, 17. | No. 400,000 circ. mil |
| 5. | Bank Lamps..... | 311 | 2. | No. 2 |
| 6. | 1st, and 3d and 4th Fl. Lts., Shaft No. 2..... | 932 | 4, 6, 8, 10. | No. 300,000 circ. mil |
| 7. | 5th, 6th, 7th Fl. Lts., Shaft No. 2..... | 986 | 12, 14, 16. | No. 400,000 circ. mil |

Let it be remembered that the plan of the general wiring had always to take into consideration that the building was to be erected in sections. It often happens, for this reason, that an outlet will be nearer another distribution panel than it is to the one from which it is fed.

The entire interior conduit system is concealed, either in the floor construction, through which the fixture hanger extends, or chased in the walls, the lighting feeders and mains being three-wire and all branch circuiting two-wire.

One noteworthy peculiarity in the arrangement of the distribution boxes is that they are, wherever possible, set behind a full-sized door of exactly the same pattern, size, etc., as the other doors in the rooms in which they are found; thus a fine harmony is preserved in all the interior woodwork. Inside of this door is an interior door, opening upon the distribution box. This second door is lined with plate glass covering the diagrams of circuits. The distribution boxes are slate-lined with white marble panel boards provided with double-pole knife-pattern circuit switches and also with a short goose-neck and key socket so that a lamp may be attached if a light is necessary. Two extra switches are set on each panel. The polished copper busbars are arranged on the front of the panels. The centers of distribution are of the same construction as the distribution boxes and are set above them, behind the same large door described above. They are of the same white marble as the panel-boards and have fused main switches. There was no distribution box used on the first floor of the bank. The distribution box for this section is in the basement below and the lamps are controlled by local switches set on the columns.

The wires throughout the building are of sufficient size to supply all lamps simultaneously with a loss of not more than 2 per cent between the switchboard and any lamp. The difference between any two lamps does not exceed 2 volts, the voltage at the lamps being 115.

All motor wiring is done on a two-wire basis with insulation

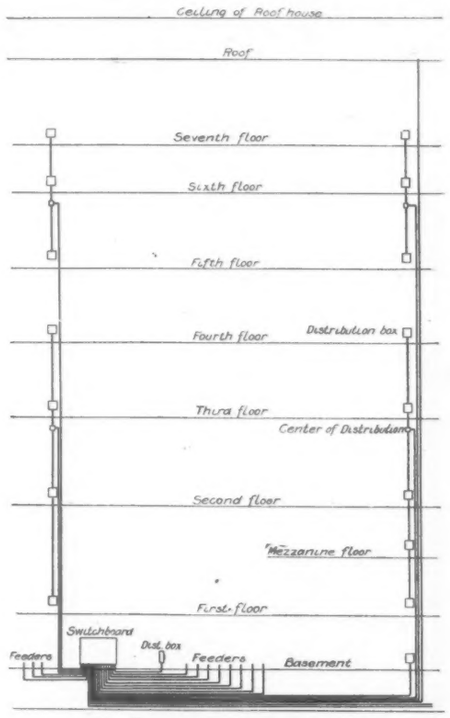



FIG. 8.—FEEDER ARRANGEMENT.

for 500 volts. The switches at each motor outlet are enclosed in slate-lined switch boxes. All motors in the machine-room are wired directly from the switchboard, the controlling rheostat and switch being mounted on brackets on top of the motor frames.

Owing to the number of desks in the building, each to have its own desk lamp, a great number of floor outlets were used, the wiring extending up from the floor to the desk, cases, etc., through brass tubing. As before mentioned, the wiring also extends up into the screens of the bank, being run in conduit along in the cornices which were built specially to accommodate this design and outletting in specially designed outlet boxes set at each fixture.

Neither the bank vault nor the insurance vault was pierced by the electric wiring. This necessitated plug receptacles and switches on both the inside and outside, with flexible connectors. Feed wires run to a floor box at the point where wires are brought through the vault plates. The wiring inside the vaults is run in polished steel conduit, with outlet boxes finished to match the vault. At each outlet in each vault is a five-lamp wireless cluster with an 18-in. white porcelain shade,

and in each vestibule a key receptacle and small prismatic globe. In general, the ceiling outlets throughout the building, except in the public corridors, are controlled by local switches set in gangs on the columns.

The low-potential work throughout the building is, in general, about that of the usual high-class office building. As with the high-potential work, the chief complication arose from the number of clerks' desks to be supplied and interconnected. The conduit and wiring for the public telephone was put in under the electrical contract, all wires being run in concealed conduit and all the necessary interconnecting boxes being installed by the contractor. These boxes have the general construction of distribution boxes, with copper-screw terminals on slate strips. The boxes at the outlets are the same as other electric boxes, but with brass covers bushed for extension to instruments. The central of the system for all working portions of the building is on the sixth floor. From it a 25-pair cable is run to the service entrance, with three twisted wires to each outlet. Besides this cable, five-pair cables are run from the service entrance to the local telephone centers in the bank and in the department of insurance on the first floor. Wherever possible, standard paper-insulated, lead-sheathed telephone cables are used.

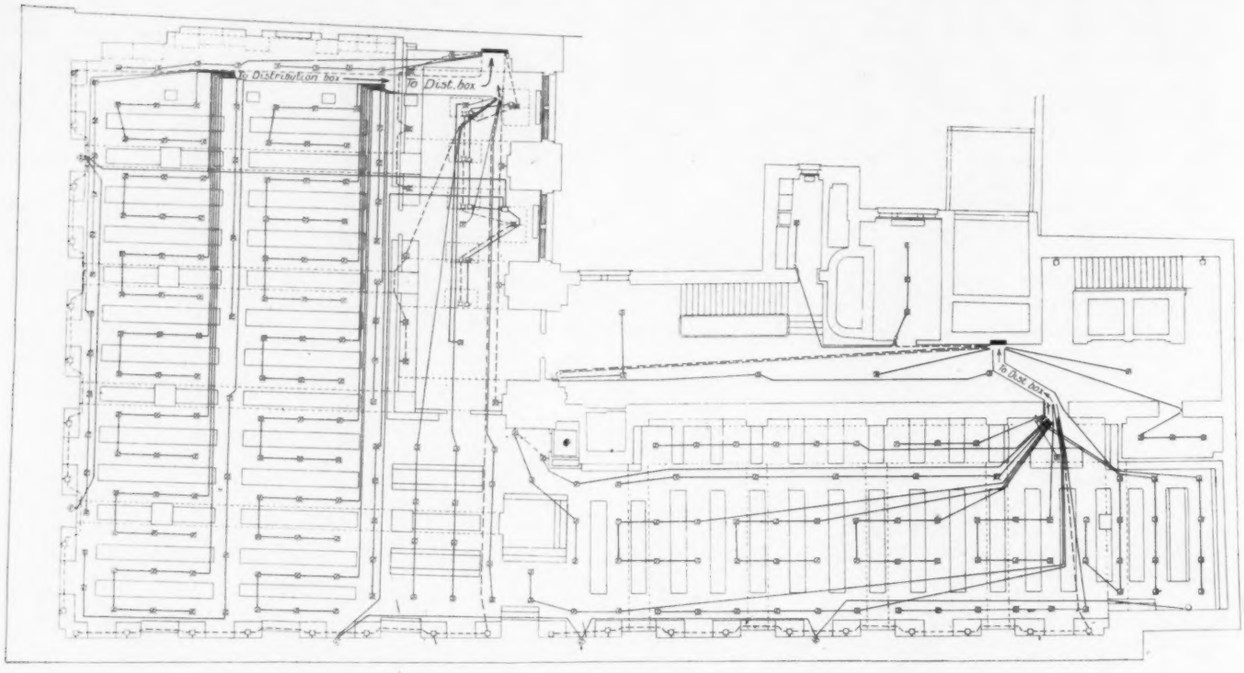



FIG. 9.—FURNITURE LAYOUT AND ELECTRIC LIGHT AND BUZZER CIRCUITS ON SIXTH FLOOR.

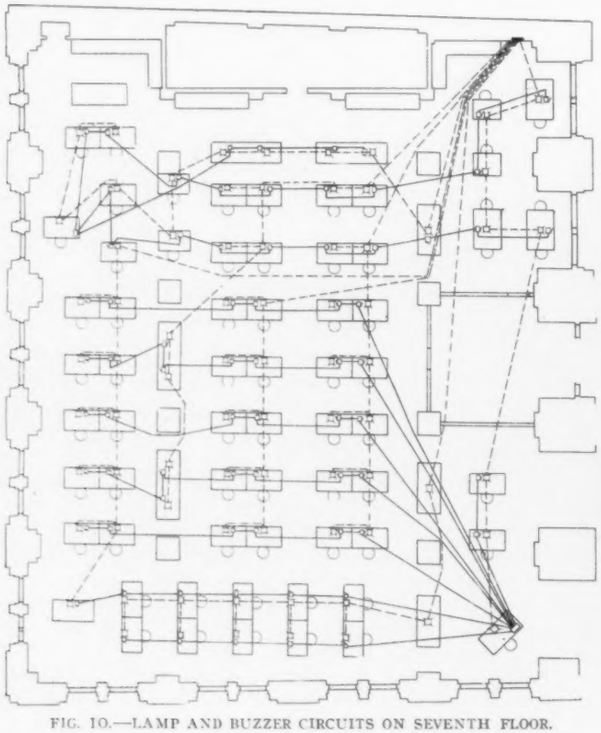


FIG. 10.—LAMP AND BUZZER CIRCUITS ON SEVENTH FLOOR.

In addition to the public-telephone system there was also installed a house-telephone system, with its central also in the telephone-room on the sixth floor. This system is run in the same general way as the public system. The switchboard for this private system is exactly like those which telephone companies furnish, with all the features which an ordinary board

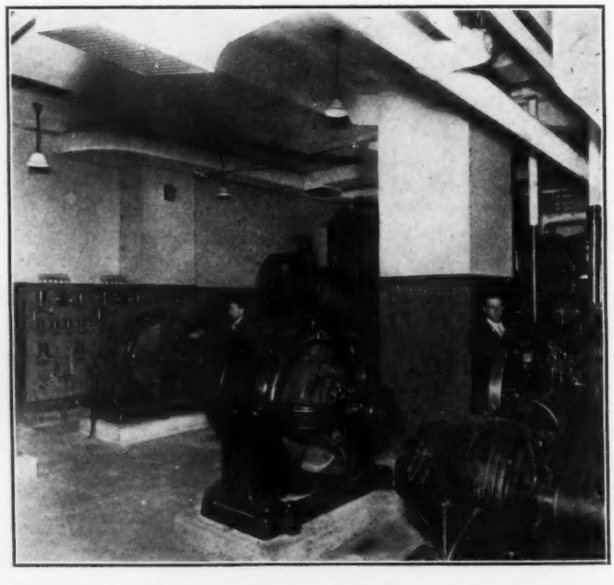


FIG. 11.—MOTOR-DRIVEN HYDRAULIC ELEVATOR AND VACUUM PUMPS.

has. The instruments are of as high a grade as those used by the local telephone company, but of sufficiently different shape to be easily distinguishable. For this house-telephone system, as well as for bells, buzzers and the electric signal system throughout the building, a low-potential generating and storage-battery system was installed. The motor generators, three in number, all arranged for interconnection, are located in the basement machinery-room.

The low-potential switchboard connected with this system (Fig. 4) is constructed like the main high-potential switchboard and is set immediately over and back of the motor generators. It is provided with ammeter and voltmeter and switches for same, also with copper knife switches for distribution, charging the battery and tying the systems together. The rheostats connected with the motor generators are set on the board.

The ringing system of both the house and intercommunicating telephones is connected directly off the busbars, which are always kept alive. A night storage battery, with arrangements for switching it onto busbars, is provided for the use of the ringing service when the low-potential motor generators are not running. But the talking system is taken off the storage batteries, which are charged by motor generators, and of which there are two sets, one for the house system and one for the intercommunicating system. The intercommunicating system referred to above is for the use of the bank and has 15 stations.

FIG. 12.—MAIN CORRIDOR OF BUILDING.

In planning the call-bell system, the engineers had to lay out special work, as in insurance offices it is necessary to have such connections between the chiefs' rooms and many of the clerks. The grade of wire, the kinds of outlets, the manner of installation, etc., are all the same as those of the high-potential system. The energy for this entire system is supplied through feeders connected to the ringing buses of the low-potential switchboard. The wiring is run up through the desks, the same as in the high-potential system, and flush-type buzzers and annunciators are set in the desks and cases.

The building is provided with two complete systems of watchman's clocks and key stations. One of these systems is for the bank alone, the other has its master recorder in the superintendent's office on the seventh floor. The wiring for these is also the same in grade of wire, conduit, etc., as the high-potential system.

There is also a system of burglar alarms connected with the vaults. These alarms are wired for connection with public burglar-protection service.

The time clocks of the building are electric and are wired from the master clock in the superintendent's office on the seventh floor. The secondary clocks have 12-in. dials, with dust-proof metal cases, and one is provided for each office and each department, besides a specially ornamented one for the public corridor. The wires for these clocks are of the same grade as those used in the lighting work and are run in iron conduit, with an iron outlet box for each clock. The energy for this system is taken from a primary battery at the master clock.

The plan of erecting the building in sections proved, on the whole, an entirely satisfactory one, the architects, Messrs. G. B. Post & Sons, having carefully worked out the details of the construction. The electrical engineers for the building were Messrs. Pattison Brothers, and the contractor was Mr. J. P. Hall, all of New York.

## Connections for a Single-Phase Wattmeter on a Three-Phase, Three-Wire System.

BY F. CONRAD.

ALTHOUGH modern switchboard practice tends more and more toward the use of polyphase wattmeters for three-phase systems, there are still a large number of single-phase meters used, especially to indicate the load on a generator or feeder when the system is practically balanced and when strictly accurate readings are not required. For generators or feeders it is usually sufficient to know roughly the load carried at any particular time. As a rule, the load in either case is changing from time to time, so that there is no advantage gained by using an expensive instrument, as it will be found in practice that the needle of the meter will be swinging constantly, making it impracticable to take precise readings.

There are in general use two methods of connecting a single-phase meter to indicate the load on a three-phase, three-wire system. One requires the use of two series transformers and one shunt transformer and the instrument may be an ordinary single-phase instrument—that is, the scale need not be a special one and if properly connected overload relays may be operated by the same series transformers. This introduces a slight error in the reading of the wattmeter, but not sufficient to be objectionable. The other method requires the use of but one series transformer and two shunt transformers. There is practically no advantage in either method as to cost, because it is customary to use two series transformers in order to connect in overload relays, as well as two shunt transformers, the latter being used in connection with a pilot lamp and synchronoscope as well as the wattmeter. With the second method, a Y resistance box is essential and a special scale for the instrument.

In Fig. 1 are shown the connections for a single-phase wattmeter without a Y-box. The series transformers must be connected as shown. The beginning of one secondary winding, as $a^1$ is connected to the end of the other at $b^2$ and $a^2$ is connected to $b^1$. A tap from each of these wires is run to the current coil studs $E$ and $F$ of the wattmeter. There must be a non-inductive high resistance connected in series with the potential coils of the meter. This latter is sometimes contained in the instrument case, but may also be in a separate box. In either event it must be in series with the potential coils. The series transformers may be connected in any two lines, but it is customary to install them in the outside lines $A$ and $C$. The potential coils must then be connected across the phase $A$-$C$, or, what is the same thing, to the corresponding secondary wires. The synchronoscope may be connected across $A$-$B$, and a

lamp across *B-C*. The wires from the potential studs *c, d* must go to the two lines containing the series transformers. If the meter should happen to indicate backward it is necessary to transpose the wires at the potential studs *c, d*. If, as in this case, shunt transformers are used, these wires go to the secondary wires, which must correspond to the primary wires connected to *A* and *C*. An ammeter to indicate the current

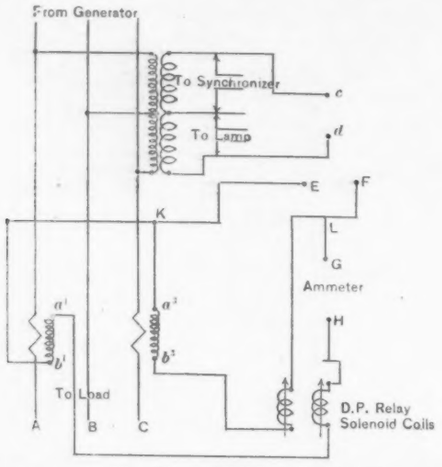



FIG. 1.—SINGLE-PHASE WATTMETER, ONE AMMETER AND DOUBLE POLE RELAY ON A 3-PHASE, 3-WIRE CIRCUIT.

flowing in one line may be cut in on one secondary circuit between *L* and the series transformer.

It is sometimes desirable to connect in three ammeters to indicate the current in each line, but with this method of connecting the series transformers, it is impossible to operate the three ammeters from the two series transformers, as the current in the common return wire *E K* is, in this case, equal to the resultant of the currents in the two secondary circuits at a phase displacement of 120 deg., and is equal to either current (assuming them to be equal) times 1.732. Hence an ammeter connected in this wire would have an incorrect reading. As the load is necessarily a balanced one, or the use of a single-phase meter would be out of the question, one ammeter is all that is necessary, and if this is cut in wire $L\,b^2$ it will indicate the current flowing in line *C*. If cut in wire $L\,a^1$ it will indicate current in line *A*.

If a relay is to be used, one coil should be cut in wire $L\,b^2$

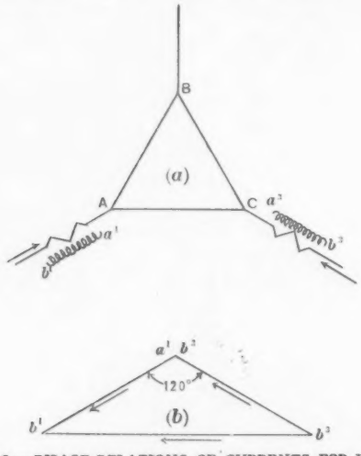



FIG. 2.—PHASE RELATIONS OF CURRENTS FOR FIG. 1.

and the other in wire $L\,a^1$. The relay will then protect the circuit fully against short circuits or overloads. If there are either one or two switches to be opened by the relay, the contacts closing the trip coil circuits should be connected in multiple—that is, either solenoid core will close the trip-coil circuit. Connections for the trip coil when one switch is used are shown in Fig. 5, and when two switches are used, the connections are shown in Fig. 6. In the latter case *a* and *b* are automatic switches on the main switches Nos. 1 and 2 respectively. They close and open with the main switch, so the trip coil is not in circuit when the main switch is open.

The time-phase relations of voltage and current are shown in the vector diagram (Fig. 2); at (*a*) the lines *A B*, *B C* and *A C* represent the voltage of a delta-connected, three-phase system; the lines *A*, *B* and *C* represent in direction the resultant of the currents from two phases respectively—that is, the current in line *A* is the resultant of the currents in phases *A B* and *A C*; likewise the current in any line. The small arrows show the instantaneous direction of the currents; $a^1b^1$ and $a^2b^2$ being the secondary windings of the series transformers. At (*b*) (Fig. 2) the lines $a^1b^1$ and $a^2b^2$ represent the direction and magnitude of the currents flowing in the secondary windings and the resultant of these two currents, which are displaced 120 deg. from each other, is equal to the line $a^2b^1$ and, at unity power factor, is directly in phase with the voltage across *A C*, and its value is equal to the current in either $a^1b^1$ or $a^2b^2$ times 1.732.

It will be readily seen from the diagram (*a*), Fig. 2, that in this system the line voltage *E* is equal to the phase voltage *e* and the line current *I* is equal to the phase current *i* times 1.732. The connections for the instrument do not differ for a Y-connected system with no neutral, as in that case the phase

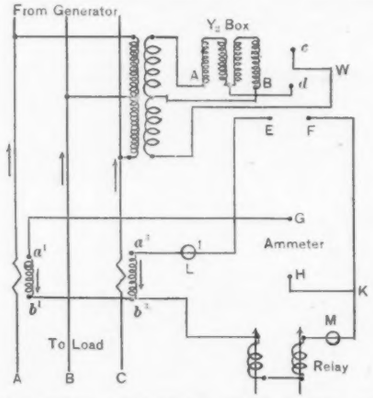



FIG. 3.—SINGLE-PHASE WATTMETER WITH Y-BOX, ONE AMMETER AND DOUBLE POLE TIME RELAY ON A 3-PHASE, 3-WIRE CIRCUIT.

current *i* is equal to the line current *I* and the phase voltage *e* is equal to the phase voltage $e \times 1.732$. In either case the potential and current coils of the instrument must be suitably wound. For example, assume a delta-connected system in which $e$ = phase voltage = 2400; $E$ = line voltage = 2400; $i$ = phase current = 100; $I$ = line current = 173.2, and a power factor of unity. The watts in one phase would be $W = E \times i = 2400 \times 100 = 240{,}000$, or 240 kw. Hence, in the three phases the kilowatts would be $3 \times 240 = 720$ or the formula for a three-phase system gives it directly $W = E \times I \times 1.732 = 2400 \times 173.2 \times 1.732 = 740$ kw. As this is a single-phase meter it is, of course, suitable for a single-phase system. Suppose a shunt transformer with a ratio of 20 to 1 is used, there would be impressed on the potential coils of the meter $2400 \div 20 = 120$ volts. A series transformer with a ratio of 60 to 1 would give the current coils $100 \div 60 = 1\frac{2}{3}$ amp, and the instrument would have a scale so calibrated as to read the kilowatts in the system or $2400 \times 100 \div 1000 = 240$ kw. For a three-phase system it must indicate three times that much.

In using the meter on a three-phase system, as assumed above, shunt and series transformers of the same ratio must be used. The potential coils would have 120 volts impressed on them, as in the single-phase system; but it will be noted that the primary of the series transformer carries the line current *I*, which is equal to the phase current $i \times 1.732$ or 173.2 amp. Each series transformer secondary would therefore carry $173.2 \div 60$ or 2.89 amp, as the two secondary circuits are so connected that the meter receives the resultant of these two currents displaced 120 deg. from each other, or the current of

either secondary times $\sqrt{3}$, or $2.89 \times 1.732 = 5$ amp. Referring to the single-phase assumption, the meter would have 120 volts impressed on its potential coils and 1⅔ amp flowing through its current coils and would indicate 240 kw, or the load on the single-phase system. On the three-phase system, the potential coils would have 120 volts impressed on them, but the current coils would carry 5 amp or exactly three times as much current as in the single-phase system, the phase current $i$ being the same in each case. Hence, the meter will indicate $3 \times 240 = 720$ kw, which would be correct for the three-phase system. Therefore, the scale of the instrument need not be changed when this method of connection is used.

In the foregoing the power factor is not taken into account—that is, unity power factor is assumed. At a lower power factor, the current is, of course, increased for the same load, but the meter indicates the true watts regardless of the power factor. In Fig. 1 if the full-load current in the secondary of the series transformers is 3 amp, the ammeter and relay coils should have 3-amp windings; but the current coils of the wattmeter should be wound for 5 amp. In any case, the instrument windings should be of such size that they will not overheat under full-load conditions.

The second method of connection is shown in Fig. 3. In this case the current coils of the wattmeter are connected to the secondary of one series transformer. Assume that it is the one in line *C*, the primary of the series transformer carries the line current *I* and the meter coils receive *I* divided by the transformer ratio. For the meter to indicate properly, it is necessary for the voltage to be directly in phase with the current at unity power factor, or the potential coils must be connected from line *C* to the neutral point of the system; and since there is no neutral point in a delta-connected system, it is necessary to create one artificially. This is done by connecting one terminal of the potential coils to line *C*. To the other terminal is connected two high non-inductive resistances, the other terminals of which are connected to *A* and *B*, as shown in Fig. 4. As two series transformers are necessary to operate the protective relays, it is customary to connect an ammeter in the secondary circuit of the other transformer. This will indicate the current in line *A*, one terminal of the ammater and wattmeter going to the common return wire at *K;* the relay with its two coils in series being cut in this common wire, and the trip coils connected as shown in Figs. 5 and 6. For duplicate apparatus there will be two main switches on each machine or feeder, and a two-pole relay would be necessary.

As the resistances of the potential coils and Y-box are high, the current flowing is very small, and the voltage across either resistance is equal to the line voltage divided by $\sqrt{3}$, or 58 per cent of the line voltage. Assuming as before the phase current 100 amp, the line current is $100 \times 1.732 = 173.2$ amp; but the voltage impressed on the meter is reduced in the same proportion as the current is increased—that is, 58 per cent of 2400, or 1392 volts. As the shunt transformer has a ratio of 20 to 1, the meter receives 69.6 volts; hence the meter will indicate $1392 \times 173.2 = 240$ kw, which is just one-third the total power in the system, and the meter must have a special scale reading three times normal.

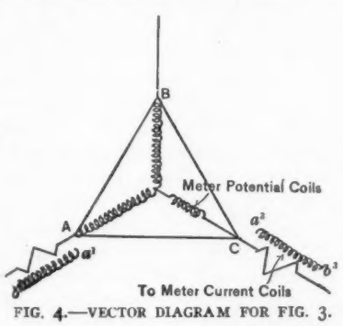


FIG. 4.—VECTOR DIAGRAM FOR FIG. 3.

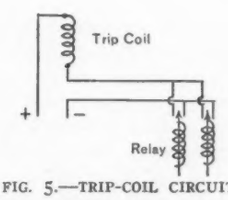


FIG. 5.—TRIP-COIL CIRCUIT FOR ONE SWITCH.

If the instrument should indicate backward, it can be reversed by transposing the wires to the potential studs. Usually a wrong connection will produce a very large error in the indication, and great care should be taken to connect the one potential stud to the line in which the series transformer is cut in, and the other to the center binding post of the Y-box. For a wrong connection, the error will vary with the power factor, and if there is more than one alternator running, an error in the connection may be detected by varying the field excitation and holding the load on the machine as steadily as possible. If the load indicated on the meter varies with the field excitation the connections are wrong. By using the method of connecting the series transformers shown in Fig. 3, two additional ammeters may be cut in at *M* and *L*. Then ammeters *G-H* will indicate the current in line *A*, ammeter *M* the current in line *B* and ammeter *L* the current in line *C*.

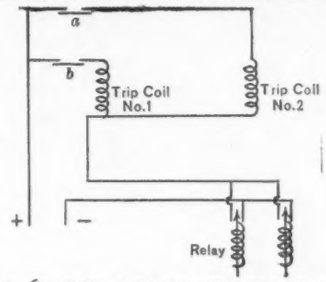


FIG. 6.—TRIP COILS FOR TWO SWITCHES.

## Double-Service Electric Railway Signals.

BY W. K. WALDRON.

IN the Feb. 11 number the writer described a solenoid-operated electric railway signal for a third-rail track circuit. The description referred to applied to roads on which the traffic was always in the same direction, and, consequently, the arrangement of track circuits and wiring connections was of the simplest form. Instances, however, occur in which one track circuit must be used to operate two or more signals controlling trains running in opposite directions on the same track during different hours of each day. The circuits then become somewhat complicated and many problems develop, the solutions of which are very interesting and instructive. Such conditions may be found on railways where two tracks are used for local trains, while a third track is used for express trains, the latter running one direction during the early hours of the day and in the reverse direction during the evening hours. The signal control must, of course, reverse when traffic reverses and possess a simple and yet positive action.

An interesting example of this double service of solenoid-signal circuits may be seen on the elevated railway at 110th Street and Eighth Avenue, New York, where it is used on the center track on which the express trains run southbound in the morning and northbound in the afternoon and evening. At this place are located two curves which are protected by one signal for each curve for each direction, making four signals in all. These four signals are controlled by five block sections, three of which are used by both the north and south bound signals, the remaining two blocks being at the extreme north and south ends of the protected portion of the line and used as release blocks to indicate when a train has passed a sufficient distance beyond the curve to allow the following train to advance; the southern block controlling the southern southbound signal and the northern block controlling the northern northbound signal.

As these articles are intended primarily for the instruction of men engaged in the installation and maintenance of this class of signals, they must of necessity be made clear and concise, each step being carefully described and the purpose of each part in a general way explained, thus making the description somewhat elementary.

The description referred to at the opening of this article applies to this installation, except as to the track relays, which, in

the former case, were less complicated in their arrangement, one track relay controlling each signal, while in this case there are two track relays required for the control of each signal. The semaphore also differs in size and shape, being smaller, and placed centrally on the signal post, as shown in Fig. 1, these signal posts being put between tracks where space is very limited. Only about 5 ft. of the upper portion of the post extends above the track, the machinery case being beneath the track level, all supported on a platform built below the tracks. Each end of the semaphore board being hinged near the post is free to swing in either direction in the event of its being struck by a passing train, thus avoiding frequent breakage.

Fig. 2 is a wiring diagram of the four signals under consideration. The section of line protected extends from about 107th Street north to about 113th Street. The direction of signaling is controlled from a point about 115th Street, where a three-point switch is located, which, as shown, governs the feed for the two sets of signals, the lead being connected with

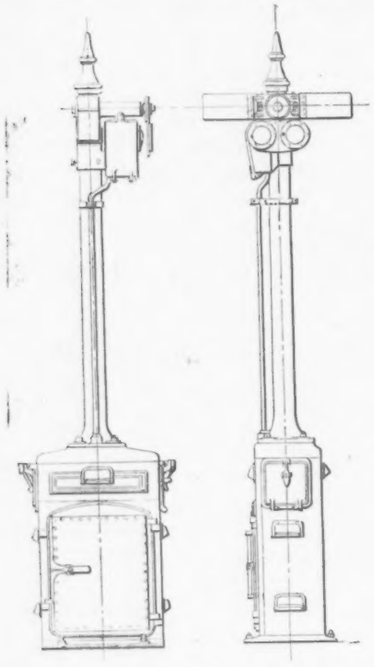


FIG. 1.—SIGNAL POST.

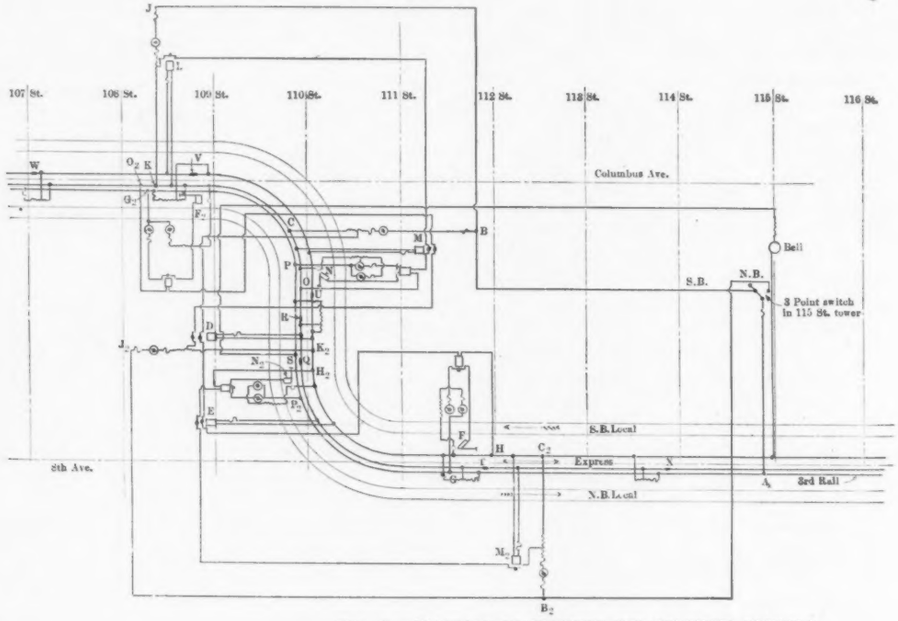



FIG. 2.—DIAGRAM OF CIRCUITS FOR SOLENOID SIGNALS.

the third-rail at *A*. The switch as set in the diagram is feeding signals for southbound trains. Following this feed wire a branch leads off at *B* connecting with the common rail at *C*. This branch has a 3-amp, 500-volt fuse snap switch and resistance tube of 3000 ohms. At the 1800-ohm point a lead is taken off, which, after passing through the track relays at *D* and *E*, picks up the solenoid relay of the signal at *F* and passes to ground at *H*, thus allowing the current from *G* to operate the signal. Returning to point *B* in the main feed line and continuing to point *J*, there is connected at the latter point a branch similar to that at *B* leading to the common rail at *K*. The lead from the resistance passes through relays *L* and *M*, picking up the solenoid relay of signal *N* and connecting with the common rail at *O* and completing the circuit from the third-rail connection at *P* to the solenoid which operates signal *N*. This description shows sequence of operations when the track is clear and both southbound signals are at "proceed" position; the northbound signals are, of course, "dead" and are at "danger."

The block section *Q R* is also used to indicate to the tower man at 115th Street when a northbound train has reached this section. The indication is given by a bell in the tower, which is rung through back connections on relay *D*, the feed for the bell being connected to the third-rail at *S*.

The action of signals on the passage of a southbound train is as follows: When a train enters the block *T-Q*, relay *E* in northbound signal case drops, thus breaking the circuit *B-D-E-H* and causing the signal *F* to go to "danger." When the train enters block *Q-R*, relay *D* also drops, thus making two breaks in the above-mentioned circuit. The train advancing, enters block *U-V*, causing relay *M* to drop, breaking the circuit *B-J-L-M* and putting signal *N* to "danger." Both signals, *F* and *N*, are now set at "danger" since the distance from *R* to *U* is less than a train's length. After the train passes *R*, signal *F* goes to "proceed" position and when the train enters block *V-W*, the relay *L* drops, making a second break in the circuit *B-J-L-M*. After the train passes joint *V*, relay *M* picks up, but as relay *L* is still "dead" the signal *N* remains set at "danger." When the train passes joint *W*, relay *L* picks up and the signal at *N* goes to "proceed" position. From the above it will be noted that each of the signals at *F* and *N* is controlled by two track relays; also that block *T-X* is not used by southbound trains.

When the northbound traffic starts the switch at the 115th Street tower is thrown over to feed into northbound signals; the southbound signals are now "dead" and stand at "danger," and the northbound signals go to "proceed" position if the line is clear. Assuming that the switch at the 115th Street tower is thrown over so as to feed into northbound signals, the circuits will be as follows: From switch, following line marked *N, B*, a lead is taken off at *B2* connecting with common rail at *C2*. This branch is similar to *B-C* and *J-K* as described in the southbound system. From tap on resistance the line passes through relay *M2*, then relay *E*, thence through solenoid relay of signal, *N2* passing to ground at *H2*, thus allowing current from third-rail at *P2* to operate signal *N2*. From *B2* the circuit runs to *J2*, where another branch corresponding to *B-C* passes to ground at *K2*. Again from resistance tap the line passes through relay *D*, relay *M* and through solenoid relay of signal *F2*, thence to ground at *O2*, allowing current from the third-rail connection *G2* to operate signal *F2*. It will be observed from this description that relays *E, D* and *M* have each two circuits under control.

When the northbound train enters block *V-U*, the relay *M* drops, breaking the feed circuit to signal *F2*, which goes to "danger." Train entering block *R-Q* causes relay *D* to drop, which by its back connection rings the bell in the tower at 115th Street. Relay *D* in dropping also makes a second break in the feed circuit of signal *F2*. When the train enters the block *Q-T*, relay *E* drops and puts signal *N2* at "danger"; when

the rear end of train passes out of block *V-U*, the relay *M* will pick up, but the signal *F2* will not go to the "proceed" position until relay *D* also picks up, which it cannot do until the rear end of the train has passed out of block *R-Q*. When the train enters block *T-X*, relay *M2* drops, making a second break in the feed circuit of the signal *N2*, and when the rear end of the train passes out of block *Q-T*, relay *E* picks up, and after the train passes out of block *T-X*, relay *M2* picks up, which, completing feed circuit of signal *N2*, allows this signal to go to the "proceed" position. In this case it will be noted that the block *W-V* was not used.

The purpose of the bell in the 115th Street tower is to call the attention of the towerman to the approach of the northbound express. The 116th Street station being between the local tracks, the express train must be switched on to northbound local track and the bell therefore notifies the towerman to hold the approaching northbound local trains. The bell is controlled by a switch in the tower, which is thrown out when the southbound traffic is passing, as there is then no need of it. This bell is wound for 10 ohms and has 100 ohms resistance in circuit. All other details are the same as described in the previous article.

Express trains run only on the Ninth Avenue line, starting at Rector Street and running to 135th Street. In this entire distance no bad curves exist except those at 110th Street, where the line passes from Columbus Avenue to Eighth Avenue. At Fifty-third Street and Ninth Avenue, where the Sixth Avenue southbound trains pass over the express tracks, the towerman is notified by bells, controlled by single-rail blocks; one located at Forty-first Street indicating the approach of northbound express trains, and the other at Fifty-ninth Street indicating the approach of southbound local trains.

# CENTRAL STATION

## MANAGEMENT, POLICIES AND COMMERCIAL METHODS

### Advertising Block Signals Electrically.

The advertisement of automatic block signals is a prominent feature of modern methods of stimulating railroad travel, and many references to this equipment are encountered in transportation publications. One of the latest examples of signal publicity, involving electricity as a motive power, is at present on exhibition in the Boston office of the Union Pacific Railway Company. A reduced size semaphore signal of the Union Switch & Signal Company's make, with a glass case around the mechanism, is installed in the window facing a crowded portion of Washington Street, and operated by two Exide storage cells controlled by a motor-driven switch, supplied with energy from the 110-volt Edison system. The signal is equipped with a 3-ft. blade, motor driven, and incandescent lighting is used behind the spectacle lenses. The operations of the signal many times an hour attract the interest of a large crowd, and inquirers entering the office are given a booklet entitled, "Making Travel Safe," describing the purpose and service of the automatic signals on this company's system.

### Making Dresses by Electric Power.

The flexibility of electric power in the operation of machinery for combined productive and advertising purposes was well illustrated recently in a manufacturing exhibit made by the department store of William Filene's Sons, Boston. The installation consisted of a motor-driven shop for the manufacture of machine-made dresses at high productive speed. The raw materials were cut, up to a maximum of 250 thicknesses, by an Eastman electric cloth cutter, capable of doing the work of 20 operators, and supplied with energy from a 110-volt circuit. The installation was provided with a 1.5-hp, 110-volt direct-current motor, driving the following machines in group: One skirt bander, one button-sewing machine, output 3000 per day; one button-hole machine, output 400 per hour, against 40 by hand; one sleeve sewer, one tucking machine, making 3500 stitches per minute; one waist machine, making 1800 stitches per minute; one sleeve machine, and one skirt machine, making 3000 stitches per minute. The individual machines were placed in and out of service by friction clutches operated by treadles. The exhibit was extensively advertised in the Boston press and attracted wide attention.

### Combined Ice and Electric Lighting Plant.

The Sterling Consolidated Electric Company, which recently obtained a franchise in Sterling, Col., is remodeling its entire primary and secondary distribution system, and is contemplating the grounding of secondaries, which is being generally recommended by underwriters in that territory.

This company has completed a combination ice and electric-light plant. The building is brick with all-brick partition walls and tar-and-gravel roof on steel supports. The boiler-room has communicating coal-bins arranged for direct dumping from cars. Two 175-hp water-tube boilers are installed, with space for a third, and an electrically driven fan operates an induced draught installation, giving at all times an easily controlled draught. The generator equipment consists of a 150-kw and a 75-kw Bullock generator directly connecting to Ideal engines.

The steam feed pipes from the boiler-room enter one main pipe steam line, which also feeds steam to a 20-ton refrigerating machine made by the York Manufacturing Company and driven by a simple Corliss engine. Space is allowed also for another ice machine of the same rating as well as for another generating unit of the larger rating.

Arc lamps for the city are fed at 2300 volts through a constant-current regulator. The company is installing its own artesian well and uses the exhaust steam for its distilled water supply. The circulating pump, electrically driven, is used for ammonia condensing and steam condensing.

This plant provides electricity for Sterling, a place of 5000 inhabitants, and is the type of plant which is becoming very frequent in that portion of the country. The engineers for the entire system and the equipment are the Mountain Electric Company, of Denver.

### Pushing Tungstens in the South.

The tungsten lamp has not been as rapidly introduced in the South as in Northern cities, and about June 1 the Mobile Electric Company, of Mobile, Ala., which is one of the companies controlled by H. M. Byllesby & Company, of Chicago, rented temporarily an average-sized store and equipped it with fans and tungsten lamps. There was very little else in the store save a desk and a few chairs. This fact in itself helped attract attention to the tungsten lamps, which were the one feature which it was desired to bring out prominently. The arrangement of lamps is shown in Figs. 1 and 2. Sixty-watt units with prismatic reflectors were used. A watt-hour meter was also fixed up on a board with the usual arrangement so that various lamps could be turned on and off and the watt-hours recorded.

The principal novelty of this method of pushing the tungsten lamp was the hiring of a special store in which to demonstrate it rather than depending on exhibitions in the company's offices, which are frequently not well suited to such demonstrations. The transparency in the front show window is for the purpose of comparing a 60-watt tungsten with a 112-watt carbon-filament lamp. There were also signs reading as fol-

lows in the show window and on the walls of the room: "This brilliant illumination is the result of installing 18 60-watt tungsten lamps in 18 Holophane reflectors and costs for current 7.56 per hour; for renewals, 0.15; total, 7.71 (cents). Let us figure the cost to illuminate your store. Mobile Electric Company." Invitations and personal letters were sent out to nearly 1000 merchants and during the three days that the store was open several thousand business men called between the hours of 2 p. m. and 10 p. m. Since about May 1 the company has been carrying on a very vigorous campaign. As a result the gas company is finding the tungsten lamp a strong competitor.

FIGS. 1 AND 2.—TUNGSTEN DEMONSTRATION AT MOBILE, ALA.

Mr. E. L. Callahan has recently taken charge of the new business department of H. M. Byllesby & Company, and it is by his courtesy we are able to reproduce the photographs of this store.

## District Electric Supply in Ohio.

The supply of electricity to other towns from a centrally located station was the subject of two papers at the convention of the Ohio Electric Light Association, July 13. One of these was by Mr. Claude Smith, manager of the Bradford & Gettysburg Electric Light & Power Company, of Bradford, Ohio, whose paper gives the following account of this enterprise:

BRADFORD & GETTYSBURG LINES.

The Bradford & Gettysburg Light & Power Company was organized in the fall of 1908 for the purpose of building and operating a transmission line to the towns of Gettysburg and Bradford, Ohio. Ten-year street lighting contracts were obtained with both towns and a contract for energy was entered into with the Greenville Electric Light & Power Company of Greenville, the county seat of Darke County. Gettysburg is a small farming settlement eight miles east of Greenville, while Bradford is strictly a railroad town four miles further east. Gettysburg has a population of about 350, practically all of whom own their own homes. Bradford has a population of about 1600.

The transmission line is built of No. 6 hard drawn copper and designed for a maximum of 60 kw at 6600 volts. Seven miles of the line is built on private right-of-way just outside the railroad property line. The remaining five miles is on a country road. The substation at Greenville is just outside of the city limits and contains the step-up transformers and the meter.

At Gettysburg a 7.5-kw transformer mounted on a pole feeds the three-wire secondary service of 110-220 volts. A small substation contains a 3-kw selective-tap transformer for street lighting with 220-volt primary and a maximum secondary of 600 volts; the selective taps being for 12.5, 25, 37.5, 50, 62.5, 75, 87.5 and 100 per cent. A small series regulator, ammeter, wattmeter and an eight-day time switch complete the street-lighting equipment. Eighteen 75-watt, 60-cp series tungsten lamps are operated on the streets, the service being all night every night from 30 minutes after sundown to 30 minutes before sunrise. The lamps are all permanently hung on 16½-ft. rigid mast-arms 16 ft. above the street.

The street lighting system of Bradford is designed for 150 lamps, 60 being in use at present. Three 15-kw step-down transformers are in use at the Bradford end and are connected in multiple feeding a main secondary system of two No. 4-0 and one No. 3-0 lines, the branches being of two No. 4 and one No. 6, the smallest being two No. 6 and one No. 8, which makes the copper loss on the secondaries of small value. The 15-kw transformers are arranged so that the two at the ends of the secondary mains can be cut out of service during the day, which greatly reduces the core losses and keeps up the regulation. The maximum voltage during the daytime is 118 to 120, the minimum at the peak load is 112 to 114.

The series tungsten street lamps have given excellent service and during the past four months only two lamps have been lost by burn-outs and 45 by defective joints between the filament and leading-in wires. Many of these lamps failed in the first 24 hours of burning.

The lighting company does not handle any supplies or do any wiring, but co-operates with the manager in this matter. Tungsten lighting was pushed from the start. The commercial rates charged for energy are first 30 kw-hours, 12 cents; 30 to 60 kw-hours, 9 cents; 60 to 90 kw-hours, 6 cents, with a 1 cent per kw-hour discount for payment in 15 days. No meter rent is charged, the minimum being $1.

The 60-watt lamp was adopted as the best for fighting gasoline as the operating cost is less and in small towns the financial end is the strongest argument that can be produced. In one instance a 15-light gasoline plant was displaced by 15 60-watt lamps, one 40-watt lamp and several 16-cp lamps for use in the basements and storage rooms. The gasoline had been costing $12 per month, with $2 for the oil lamps in the basements and a night lamp. The first month's energy, February, cost $8.32; March, $6.25; April, $6. In May this firm purchased a power coffee mill, the May bill being only $6. At the present time only three gasoline plants are left and they are less than a year old. The owners are willing to take electricity at the first sign of trouble.

The residence proposition has been very easy as the 24-hour service is of such character as to commend itself to all.

By pushing the 25- and 40-watt lamps a large number are coming in under the $1 minimum charge. This makes the introduction of flatirons and heating appliances very easy. The irons are put out on 30 days' free trial. Nothing but high-grade irons are used and during the past month, 20 irons have been sold. Almost all the wiring has been installed by the manager, who from experience has found that but few people know what they want, and for this reason he has always offered advice as to the proper equipment, and in fact has refused to install work that was not standard. For tungsten lighting in many cases it was necessary to agree to make any desired change if the tungsten service was not satisfactory, hence all tungsten lamps have been installed well out of reach with suitable Holophane ware and independent switches, with the result that the breakage has been very small and service good. Where consumers are timid about trying irons, the outlet is installed free of charge. By actual test the irons put out are more economical than gasoline even at a 11-cent rate. On June 1, 105 meters were in service and 50 applications on file. The aim is to install 300 meters in the two towns and to rent house wiring. The power question has as yet received but little attention. The gasoline machines now in use do not total over 50 hp. A small ½-hp motor is being used to demonstrate coffee mill service. This motor is belted to any old coffee mill that happens to be handy, and after a few days' use the company obtains an order for a direct-connected outfit.

O. H. HUTCHINGS' PAPER.

Mr. O. H. Hutchings, superintendent of the Dayton Lighting Company, Dayton, Ohio, gave a paper on the same subject, taking up some of the general principles involved as follows:

Looking at the question from the standpoint of the smaller central station which it is proposed to supply, some, if not all, of the following conditions of operation obtain: (1) Limited hours of operation—no day service; (2) simple, non-condensing prime movers; (3) street lighting operated on the moonlight schedule.

It is very apparent that the actual cost of each unit output of a central station in this class is necessarily high on account of excessive coal consumption per unit output; extremely low "load factor," meaning that the investment is returning revenue a small percentage of the total time. In a general way, the investment in generators, engines, boilers, pumps, piping and buildings necessary to equip a small generating system of this class, compared with its equivalent rating in transforming apparatus, buildings, etc., is approximately in the ratio of 5 to 1. Other important points greatly in favor of purchased energy are: (1) The complete elimination of that portion of labor necessary to operate a generating station; (2) the complete elimination of steam maintenance charges; (3) greatly reduced electrical maintenance charge; (4) the important feature of continuous 24-hour service, permitting taking on what day load may be available without additional expense other than the purchase price of additional units sold.

All of the above items effect a decided reduction in the total running expense of the small central station, and the last item is probably the most important of all. Applying this argument to central stations in cities of 15,000 population, in a general way the demand upon a station would be occasioned by (1) a limited amount of connected industrial power, together with a small demand for daylight lighting, representing the day load; (2) the usual amount of commercial and residence lighting, together with the street lighting, representing the night load.

One would not expect more than one theater in a city of this size, and it giving only an occasional performance during the theatrical season, and there would not be a large amusement park to offer a market for energy during the summer months. The object in itemizing the various classes of service as above is to show the very slight opportunity offered for a diversified load. As it is now generally conceded that the "diversity factor" is a very potent element necessarily considered in determining the true load factor of individual apparatus, or station equipment, it is very evident that the result must be high fixed charges per unit output where diversification of service is lacking.

Unfortunately many smaller central stations are so located that they cannot attain a total production cost sufficiently low to enable them to compete successfully with private power plants; on the other hand, they do not feel justified in increasing their investment to the amount necessary to correct their general condition. Such stations should welcome the first opportunity of purchasing electric service.

A central station designed to supply the service outlined in this paper should be as nearly perfect mechanically and electrically as engineering skill and capital make possible. It must be so arranged that an interruption of the supply of its output is next to impossible. The transmission lines for delivering its output must be designed for absolute continuity of service under all conditions. The transmission voltage may be from 6600 to 60,000 volts (higher, if necessary), depending upon the load and the length of each transmission line; about 1000 volts per mile is considered good engineering practice. In passing through thickly settled rural districts, by installing a lowering transformer at a central, convenient point, it would be possible to supply these districts with, say, 2300 volts, to be further lowered to a normal voltage of secondary distribution at the points of usage.

The location of a generating station whose output is to supply surrounding territory must be very carefully considered. In a general way the location should be near the electrical rather than the geographical center of the territory to be supplied, and preferably near a large manufacturing center where a ready market can be secured for a good portion of its output. This will greatly assist in bringing about that very desirable and important point previously mentioned, "diversification of service," on account of the great variety of business that is obtainable in any large city. For illustration, the following are cited: An endless variety of industrial power; local street railway system; operating city waterworks electrically; charging electric automobiles, both pleasure vehicles and heavy haulage trucks; municipal lighting; special boulevard lighting; several theaters operating nightly; summer amusement parks; sign, outline and decorative lighting; interurban railways.

The above do not represent an ideal condition, impossible to realize; on the contrary, such business is being developed every day by progressive and aggressive organizations. A central station enjoying the diversity factor made possible by the above outlined demand for its output, is in position to produce its output at such a cost that, plus the transmission costs, it can supply all the surrounding territory within a reasonable radius (that is now being supplied from several smaller central stations) on a basis that will remove all doubt from the minds of the managers of the small central stations regarding the advisability of availing themselves of the opportunity of purchasing, rather than generating, their electric energy. As time goes on it will be more and more the best plan for the smaller central stations to purchase their energy from the larger companies within proper distance to supply it economically; and plans for future improvements and enlargements in any central station should be considered with this end in view. It is the spirit of the times to centralize and combine in many lines of effort, and why should it not be equally as good and economical for central stations?

*Discussion.*

Mr. D. L. Gaskill, of Greenville, president of the company which sells energy to the Bradford & Gettysburg line, told how, when he had been approached to sell electricity to such an enterprise, he had at first been unfavorable to the idea. At last, however, he had been prevailed upon, and now thought the plan an excellent one. His company sells energy at 3.5 cents per kw-hour, measured at the Greenville city limits, before the step-up transformation. Service was begun last December.

Mr. Smith in discussion gave some further points of interest. The first electric light plant at Bradford was built in 1893 to operate with gasoline engines. This was a failure and the

plant was later steam driven. A little later it was abandoned and was idle for seven years. Its history was one of repeated failures with trying to maintain a separate generating plant. Mr. Smith said that he is now constructing a line and distributing system to supply Liberty, Ind., from Richmond, Ind. He gets $48 per year each for 75-watt tungsten lamps lighted all night every night. All consumers are on meters. The average rate for energy is 13 cents per kw-hour. Distribution losses are low because there is only one step-down transformation from 6600 to 220 volts. In Bradford there are three step-down transformers located at secondary centers of distribution. Two of these transformers are cut out by switches placed on the poles and operated by ropes when the load is light, thus keeping down the core loss. The Bradford & Gettysburg Electric Light & Power Company is bonded for $25,000. The present maximum load is about 25 kw. The system is capable of supplying a load of 60 kw.

Mr. F. M. Tait, of Dayton, expressed the opinion that the lighting plants of the small towns would be forced to district supply ultimately because they cannot continue with operating expenses 105 per cent of the gross receipts. Mr. W. C. Anderson, of Canton, told of a 5500-volt transmission line which his company had been operating to a neighboring town for six years. On this line a step-down transformation from 5500 to 230 and 115 volts is made in the town. Mr. Smith said that on the Richmond-Liberty line now building a step-down transformation will be made from 13000 to 110 and 220 volts.

The question came up as to the feasibility of taking electricity for lighting small towns from high-tension transmission lines of electric railway companies and the best method of voltage regulation in such cases. One member reported taking energy off of a 33,000-volt traction line. Mr. Culver suggested that where there is a load of 100 kw or more to be taken from such a transmission line it would pay to put automatic voltage regulators on the station generators. The difficulty of this plan is that the compounding of the regulator may be right to produce a steady voltage with a certain load at a certain point, but if the lighting load is taken from more than one point on the transmission line the compounding cannot be right for all of them. He also spoke of using induction regulators for regulating the voltage of local lighting lines.

Mr. J. R. Cravath called attention to another plan, which is rather an expensive one, but nevertheless very effective; namely, that of using a synchronous motor-generator at the substation from which it is desired to obtain lighting service and placing an automatic voltage regulator on the generator of the set.

Mr. Claude Smith said that the Bradford & Gettysburg line, 12 miles in length, cost $800 per mile, including 60 kw in step-up and step-down transformers. He advised companies to build on private right-of-way as much as possible. The private right-of-way of his company was along the fence line. As to supplying farmers along the line, he has a 1-kw transformer for this purpose on the high-tension line. In this case the farmer builds the necessary pole lines and pays 50 cents per month transformer loss.

# INTERIOR WIRING AND ILLUMINATION

## Tungsten Arch Lighting at Grand Rapids.

Burton Heights, a suburb of Grand Rapids, has adopted the scheme used on the principal downtown streets of that city for special lighting of its business street. This plan, it will be remembered, consists in hanging tungsten lamps from a span wire in such a way as to give an appearance of an arch at night. The number of lamps can be varied to suit the requirements of the street. The spans are usually about 110 ft. apart. Use is made of series lamps connected across a 220-volt constant-potential circuit.

## Suggestions on Home Illumination.

Mr. H. J. Gille, contract agent of the Minneapolis General Electric Company, has recently caused to be issued a 22-page pamphlet, 6 in. x 9 in. in size, entitled "Home Illumination; A Few Suggestions by the Commercial Department, Minneapolis General Electric Company." The first two pages are given to general suggestions as to the advantages of electric light, and especially the tungsten lamp. The pamphlet then takes up in detail plans for the lighting of a six-room house, showing the location of the outlets for lamps, switches and baseboard receptacles. The first and second-floor plans of such a house are shown with the outlets marked thereon. A paragraph of text is given to each room. No definite suggestions are made as to lamps, glassware or fixtures, the idea being mainly to suggest typical outlet and switch arrangements which are most desirable.

The lighting arrangements for typical seven-room and eight-room houses are also treated in the same way. The wiring plans are followed by the company's rates for electric service; selling prices of incandescent electric lamps; an explanation of measurement of electricity; a suggestion as to fixtures and glassware; a directory of electrical contractors, electric fixture dealers, electric elevator dealers and electric sign manufacturers in the city. The pamphlet puts good, standard, sensible suggestions in concrete form for use in such shape as to be of material assistance in planning the wiring of the great majority of houses.

## Tests of Flaming-Arc Lamps.

Referring to the test of various lamps for street lighting by the South Park Commissioners of Chicago, as mentioned in

FIG. 1.—TESTS OF FLAMING-ARC LAMPS.

the *Electrical World* of July 29, page 241, Mr. H. Caird, manager of the engineering department of the Excello Arc Lamp

FIG. 2.—TESTS OF FLAMING-ARC LAMPS.

Company, in Chicago, furnishes some information about the series flame arc lamps under test. The installation comprises 11 lamps, spaced 100 ft. apart and suspended 25 ft. from the ground. Prismatic inner globes are used, giving a maximum

distribution at 30 deg. from the horizontal. The following figures were submitted to the commissioners by the lamp company to show the relative cost of the cp-year for various illuminants in use. Taking an arbitrary figure of 1 cent a kw-hour for electrical energy, and simply including energy cost and cost of electrodes, the proposition is figured on a basis of equal illumination, as the various lamps now in use vary in candle-power. Summarized, the calculations furnished by Mr. Caird are as follows:

1. 2000-cp, direct-current, 9.61-amp, series flame arc lamp.—Watts (9.6 amp × 47 volts), 451; kw-hours per year (451 × 3.9), 1759; cost of energy, $17.59; cost of electrodes, $37.43; total cost per lamp per year, $57.02; cost per candle-power per year, 2.75 cents.

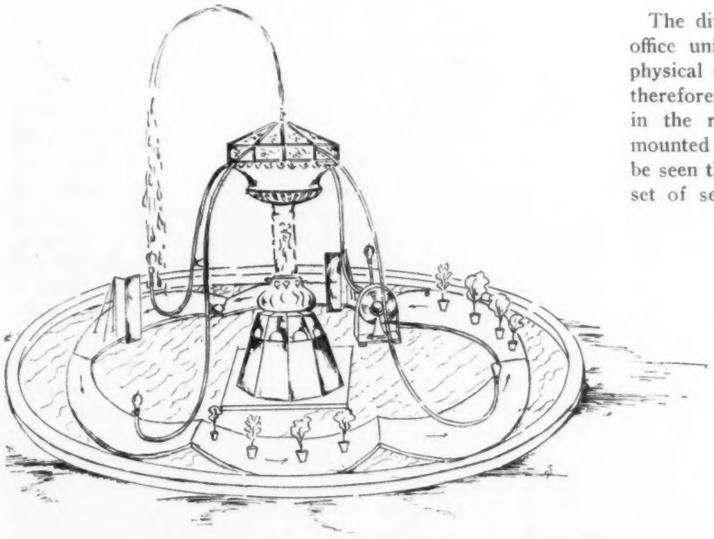
2. 600-cp, direct-current, series open arc lamp.—Watts (9.6 amp × 55 volts), 528; kw-hours per year (528 × 3.9), 2059; cost of energy, $20.59; cost of electrodes, $4.74; total cost, $25.33; cost per candle-power per year, 4.22 cents.

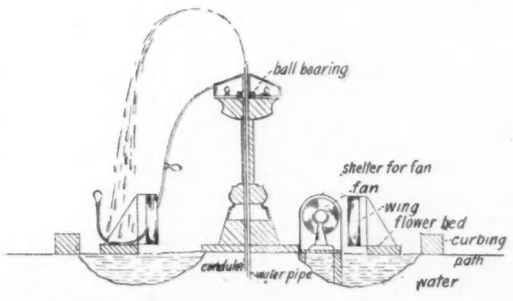
3. 300-cp, alternating-current, series enclosed arc lamp.—Volt-amperes (7.5 amp × 78 volts), 585, or 497 watts at 85 per cent power factor; kw-hours per year (497 × 3.9), 1938; cost of energy, $19.38; cost of electrodes, 86 cents; total cost, $20.24; cost per candle-power per year, 6.75 cents.

4. 1400-cp, alternating-current, series flame arc lamp.—Volt-amperes (7.5 amp × 45 volts), 337.5, or 287 watts at 85 per cent power factor; kw-hours per year (287 × 3.9), 1119; cost of energy, $11.19; cost of electrodes, $33.84; total cost, $45.03; cost per candle-power per year, 3.22 cents.

## Floating Garden in a Denver Park.

Fig. 1 is a photograph of a floating garden located in one of the pools at Elitche's Gardens, Denver, Col. The garden






FIGS. 2 AND 3.—DETAILS OF FLOATING GARDEN.

revolves around a central pillar, and is supplied with electric light. The inner construction is shown by Figs. 2 and 3. Power for revolving the foundation is furnished by an 18-in. desk fan, which is placed between the revolving part and the central post or pedestal. At equal intervals on the floating scalloped-shaped flower bed are placed eight wings, which catch the wind from the fan as they pass and cause the bed to revolve. The dome-shaped piece at the top of the post is made of art glass. The long arms leading from the dome to the flower bed are iron conduit terminating in conduits and wired for two lamps. These arms also guide the floating revolving flower bed and keep it in its regular course. The floating part is completely covered with beautiful plants which conceal the boards. The fan is sheltered with a covering of sheet iron. The center post or pedestal is made of cement and iron, and the water pipe and conduit pass through the center of the post. The ball bearing is shown at the base of the dome which carries the weight of the conduit arms. The dome is the only part of the post that revolves. Mr. C. N. Stannard, secretary

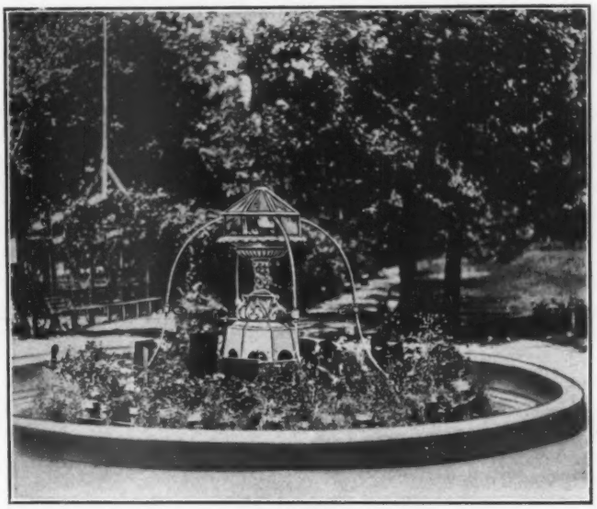


FIG. 1.—FLOATING GARDEN.

of the Denver Gas & Electric Company, through whose courtesy we are able to publish this description, says that this is but one of the many electric novelties to be seen at these gardens.

## New Telephone Patents.

DIVIDED-MULTIPLE SYSTEM.

The divided-multiple switchboard is used where the central-office unit is so large that the multiple reach is beyond the physical capabilities of the average operator. The multiple is, therefore, divided into enough parts to bring each section within the required space limits and each of these sections is mounted in an individual set of switchboard sections. It will be seen that each subscriber's line must have a signal upon each set of sections and the subscriber must also select his signal for any call upon those sections whose multiple contains the desired number. It is with this feature that the circuits described in a patent granted to Mr. W. Aitken, of Muswell Hill, England, are concerned. He arranges for three sets of sections, and by means of two keys at the substation and two line relays at the office, he controls his three-line signals. One responds to each key and the third responds to the simultaneous operation of the two keys and relays.

SELECTIVE SIGNALING.

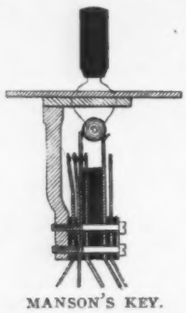
When the harmonic system of selective signaling is attempted in connection with a magnetic exchange, if the ordinary hand magnet be used there arises a difficulty from cross-ringing—that is, as the speed of driving of the hand generator is indefinite it may send out currents of any periodicity. To obviate this Mr. R. H. Manson has invented a hand generator which is

normally an open circuit and is connected to line but an instant during each revolution of the armature. The resulting momentary impulses will not ring the bells. Mr. Manson has assigned his patent to the Dean Electric Company.

Mr. H. G. Guyle, of Sargent, Neb., is the inventor of a lockout system in which the controlling mechanism is driven by weights. The establishment of a connection between two stations to the exclusion of all other stations is accompanied by the simultaneous release of what are known as "time wheels" at all the other stations. Until these complete one revolution the use of the line is exclusive. Thereafter any station can interrupt. The weights of the clockwork are so arranged that if allowed to run down they cut the station off the line until properly rewound.

IMPROVED APPARATUS.

Below is shown a key, the invention of R. H. Manson, whose patent is assigned to the Dean Electric Company. It will be seen that in this key the left-hand sets of springs are not all contact-making, those bearing on the key-lever roller



MANSON'S KEY.

being actuating springs only. It will thus be seen that to effect the key contacts a considerable movement must be given the actuating spring. The key adjustment is thus given much wider limits, and the key lever is never in a free position.

Another patent assigned to the Dean company is one granted to Mr. W. W. Dean for a pressed-metal transmitter mouthpiece. The contour is standard, except that the walls are of uniform thickness. The mouthpiece is worked up from a single piece of steel, the usual perforated partition being at the end of the threaded extension.

Mr. G. Angelini, of Rome, Italy, has patented a transmitter in which all walls of the microphone button except the actual operating surfaces of the electrodes are protected from the granular carbon by felt or fibrous linings. It is claimed this overcomes the jacking tendency.

An antiseptic device forms the subject of a patent granted to Eliza C. Smith, of Washington, D. C. A metal holder is attached to the transmitter mouthpiece and paper protecting cones may be inserted in the mouthpiece supported by the ring of the holder. The cones come folded, the points being cut off and a tissue diaphragm attached in a manner to close the small end of the cone.

AUTOMATIC EXCHANGES.

A sender for an automatic system has been patented by Mr. F. G. Agrell, of Stockholm, Sweden, which is especially adapted to operate in conjunction with automatic apparatus of his own design. The desired number is set up on a number board by individual digits, and then in connection with the rising of the hook switch the selection is sent in.

Mr. M. Baumer, of Nuremberg, Germany, has patented an automatic sub-exchange system. A number of neighboring subscribers are connected to the sub-exchange, trunk lines connecting this to the central office. Calls are then relayed to and from them automatically.

TRANSMITTER.

Mr. C. Adams-Randall, of New York City, has patented a transmitter especially adapted for carrying currents of much greater magnitude and voltage than those to which a transmitter is usually subjected. His invention consists in using a large section granular button under considerable pressure, so as to do away with any chance of arcing or "frying."

# Letter to the Editors.

## Self-Induction.

*To the Editors of Electrical World:*

Sirs:—That self-induction is a subject of certainly no less interest to the electrical engineer than, for instance, the question, "Looping Versus Cutting Theories of Electromagnetic Induction," need not be discussed. It seems, however, that the main point to which I wish to draw attention as being of particular interest to the electrical engineer has not been sufficiently emphasized by me, for it is entirely left out of consideration in your remarks following my letter on page 1599 of your issue for June 24.

The explanation of the inertia of ponderable matter which you bring into the debate may be misunderstood as a contradiction of what I said, while, on the contrary, it fully corroborates it. The electronic theory is not based on "the inertia of moving charges," as is often believed; it does *not* explain electromagnetic phenomena by *means of inertia.* Besides the electrostatic field, it is the electromagnetic field, due to moving charges devoid of inertia, which forms the essence of the theory. The electromagnetic field depends upon the path of the electric current, be it a conduction or a convection current. Inertia depends only upon the speed of every material part of given mass. All experimental investigations of electronic effects have shown that the total result is fully accounted for by means of the magnetic field due to the electrons; there is no part left that can be attributed to inertia of the electrons. Therefore, the electrons must be devoid of inertia. Nevertheless, there is some resemblance to inertia, and this led to the idea (as yet only a plausible supposition) that the inertia of ponderable matter may also be attributable to the magnetic field due to electrons. Should this prove to be true, then the original aim of electric theories will be reversed; electromagnetic phenomena will not be reduced to mechanical causes and means, but mechanics will be explained by means of the magnetic field due to electrons.[1]

Going back to my subject—self-induction—it is seen that the aforesaid perfectly corroborates my explanations, namely, that self-induction consists only in an effect of the magnetic field due to the electric current, but has nothing to do with inertia of electricity. This is certainly of much practical importance to the electrical engineer, for, this point being settled, it is immediately obvious that to avoid the detrimental effect of self-induction (sparks, for instance) one should annul the magnetic field; the self-induction, being due to the magnetic field, is then at the same time annulled, too. The common supposition is, however, that a magnetic field is necessary to counteract the effect of self-induction, while the self-induction remains. If this idea were correct then the additional magnetic field would necessitate an increase in expenditure of electrical energy to maintain it, especially on account of the increase of magnetic saturation. This led to the opinion that the means to counteract the effects of self-induction—compensating windings and commutating poles—would be uneconomical additions to the dynamo, only to be used where they are absolutely necessary to avoid difficulties in commutation. If, however, the matter be considered in connection with the true nature of self-induction, as explained above, it is seen that a compensated machine can be more economical than a common dynamo, as in the former useless or, rather, detrimental magnetic saturation is avoided. I think that this is a result of practical importance. It is also important from the point of view of the manufacturer, for a machine which is more economical in the production of the current will heat less and therefore may give a larger output than a common dynamo; or for the same output the machine may be smaller in size and weight and therefore cheaper to make. If such a result has not yet been obtained

[1] "Ergebnisse und Probleme der Elektronentheorie," a lecture delivered by Prof. H. A. Lorentz, of Leiden, before the Electrotechnical Society in Berlin.

generally it is, nevertheless, important to know that it is possible, the problem being only to find the proper arrangements.

Sir Oliver Lodge has said: "Self-induction is not a property of the circuit." This contradiction is quite right. But he added: "It is a property of the current," and this taken alone must be contradicted, too, for self-induction is not a property of either the circuit or the current, it is rather a property of both the circuit and the current, as these together determine the magnetic field, which gives the e.m.f. of self-induction.

SCHEVENINGEN, HOLLAND. C. L. R. E. MENGES.

[The explanations given by our correspondent concerning the physical relations existing between the electromagnetic induction around a circuit carrying a current and the seeming inertia of the moving electric charges constituting the current, are evidently correct. Moreover, it is unnecessary to assign to electric charges any "inertia," because the seeming attempt of the current in an inductive circuit to prevent any change in its value is explainable with reference to well-known electromagnetic phenomena, and the change in the value of the current affects the number of charges moving so that the familiar relations existing in material inertia are not directly attributable to electricity in motion. However, it is sometimes convenient to refer to the "inertia of electric current," as is done by Sir Oliver Lodge in his recent book, "The Ether of Space," where he states that self-induction is electrical inertia. Concerning our correspondent's statement as to the supposition relating to the necessity of a magnetic field for counteracting the effect of self-induction, it seems well to call attention to the fact that convenience frequently dictates the treatment of the fictitious components of a quantity as realities, even when they are in opposition and so neutralize each other that the quantity itself disappears. Thus the mere fact that two equal opposing fluxes produce zero flux as a resultant does not render inaccurate the assumption that both fluxes exist simultaneously, provided the full effect of each flux is properly considered; in many cases the magnetomotive force by which each component flux may be assumed to be produced is a reality and must be treated as such.—EDS.]

# DIGEST OF CURRENT ELECTRICAL LITERATURE

*Abstracts of the important articles appearing in the electrical periodical press of the world*

## Generators, Motors and Transformers.

*Speed Control of Induction Motors.*—H. C. SPECHT.—An illustrated article on speed control of induction motors by cascade connection. The author discusses the connection of motors in direct concatenation and in differential concatenation. The diagram, Fig. 1, shows the connections of a cascade set in

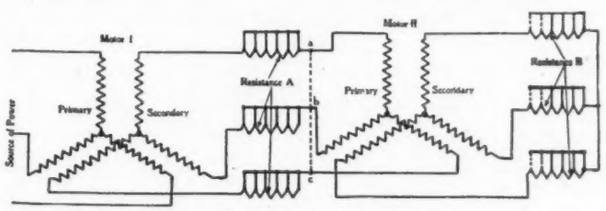



FIG. 1.—DIAGRAM OF CONNECTIONS

which two speeds can be obtained in a very simple manner without opening any of the main circuits. The full lines represent the connections when the motors are operating at low speed—that is, in direct concatenation, with some resistance in the secondary circuit of motor II. When the motor set is to be run at a higher speed the resistor at *B* will be short-circuited; the short-circuiting connections on resistor *A* will be opened step by step; the points *a*, *b* and *c* will be short-circuited, and finally resistor *A* will be short-circuited to the point giving the desired speed. The change from high speed to the low speed is accomplished by reversing the above operation. It is obvious that with this method of control the changing from one speed to another can be done in a very smooth and safe way without opening any of the main circuits. It is possible to obtain a greater number of speeds without adding greatly to the complication of the connections and still keep the main circuits closed throughout. The author finally discusses the torque of all cascade sets, both initial and running.—*Elec. Jour.*, July.

*Direct-Current Turbo-Generators.*—E. ZIEHL.—A continuation of his long illustrated paper. The author continues the comparison between the completely compensated machine and the interpole machine. He discusses the distortion of the field in the latter. He thinks the completely compensated machine is the superior type, from which further progress in the design of turbo-dynamos must be expected. He then discusses details of the design of armatures, and especially commutators.—*Elek. Zeit.*, July 29.

*Direct-Current Generator.*—A note on a recent British patent of A. H. Midgley and C. A. Vanderwell (21,936, 1908; July 15, 1909). With the object of reducing weight of the field system, these machines are provided with a second annular-ring armature upon a suitable frame carried by the inner armature shaft, and a single field system, occupying the space between the two armatures.—Lond. *Elec. Eng'ing*, July 22.

## Lamps and Lighting.

*Different Colors and Visual Acuity.*—J. S. DOW.—The conclusion of his paper on the effect of light of different colors on visual acuity. It seems that the blue-green end of the spectrum is somewhat advantageous for very close work, but not so good as red light for the illumination of objects or patterns to be distinguished at a distance. The author thinks that possibly it might be found of advantage to illuminate distant objects—clocks, etc.—with red light, which would also serve the purpose of distinguishing them from surrounding objects and tend to attract attention.—*Illuminating Eng.*, August.

*Tungsten Lamp.*—A note on a recent British patent of the British Thomson-Houston Company and H. H. Needham (23,726, 1908; July 22, 1909). The filaments are made by a squirting process from powdered tungsten, with a special binding material composed of an amalgam of cadmium, bismuth and mercury in certain proportions, which produce very fine filaments suitable for high-voltage lamps.—Lond. *Elec. Eng'ing*, July 29.

*Incandescent Lamp.*—G. LEONARD.—The first part of an illustrated German translation of his recent French paper on carbon lamps and metallic-filament lamps. The original paper has already been abstracted in the Digest.—*Zeit. f. Beleucht.*, July 10.

*Cut-Outs for Arc Lamps.*—P. S. BAILEY.—An illustrated description of automatic series and multiple cut-outs for arc lamps.—*Gen. Elec. Review*, August.

## Generation, Transmission and Distribution.

*Steam Condensers.*—F. HODGKINSON.—The first part of an illustrated article in which the author discusses the different types of condensers and points out the particular applications of each. In an editorial summary of this article by R. A. Smart it is said that, all things considered, the centrifugal jet condenser has, for the average installation, the greatest number of points in its favor. The long exhaust pipe which not infrequently is a necessity with the barometric condenser has disadvantages which must be reckoned with, but which may be guarded against in laying out the plant. The barometric type has the advantage that the circulating pump handles the cooling water on its way to the condenser, and before it is heated by the condensed steam, which is an important factor in reducing the inevitable wear and corrosion of the circulating pump, which in the other case handles hot water, particularly if the pump is of the centrifugal type.—*Elec. Jour.*, July.

*Electric Winding in Mines.*—H. ARRAGON.—An article illustrated with diagrams describing the difficulties of electric wind-

ing in mines and methods of their solution, and comparing electric and steam winding in favor of the electric system.—*L'Industrie Elec.*, July 25.

*Electric Dredging.*—S. Orling.—In a continuation of his article on the Jhelum power installation, electric dredging on the Jhelum River, in Kashmir, is described. The dipper range Himalaya is the only range in the world to be electrically operated. It is supplied with energy from two floating substations. Energy is transmitted to induction motors on the dredge at 2300 volts through a three-conductor armored cable, 600 ft. long, supported on rectangular wooden pontoons spaced 18 ft. apart and fastened between the spans by planks placed on swivels.—*Gen. Elec. Review*, August.

*Centrifugal Air Compressors.*—S. A. Moss.—An illustrated article on the development of centrifugal air compressors and the uses of compressed air. The author discusses the centrifugal compressor characteristics, the measurement of air quantity, and the use of multiple-stage compressors.—*Gen. Elec. Review*, August.

### Traction.

*Feeders for Railways.*—P. Dawson.—A continuation of his long illustrated serial on electric traction on railways. In the new section, which begins in this issue, the author discusses the arrangement and design of the transmission and distribution system. The most economical cross-section of cables, the heating of conductors and voltage drop are considered, as well as the employment of aluminum, both for overhead and underground lines. In conclusion, the use and action of booster transformers are described. The best broad rules to remember about the comparison of aluminum and copper conductors are: for equal volumes aluminum is one-third the weight of copper; for equal conductivity aluminum is half the weight of copper. The use and action of booster transformers are as follows: At various points in the track of a single-phase system are provided substations into which all the high-tension (outgoing) conductors are led. Thus the whole energy taken by the system beyond this point is brought into the substation. The energy is then passed through the primary of a transformer, the secondary of which is connected on one side to the track and on the other to an insulated return cable. The connections are shown

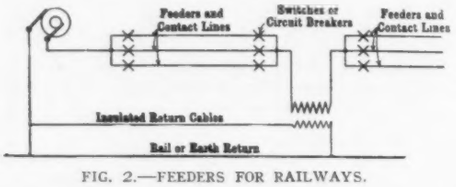



FIG. 2.—FEEDERS FOR RAILWAYS.

in Fig. 2. If the transformer is of one to one ratio, the only difference between the primary and the secondary currents will be the small current supplied from the primary side for magnetizing the booster transformer. Neglecting this, the entire current fed to points beyond the substation will be returned to the power station through the insulated return cable. Another arrangement, due to W. M. Mordey, consists in feeding energy

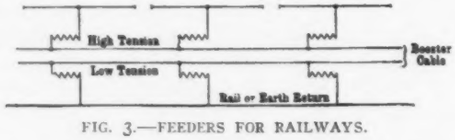



FIG. 3.—FEEDERS FOR RAILWAYS.

to each section separately from a single point, as shown in Fig. 3. In this arrangement, by making the sections equal, each transformer has the same loading. Against this advantage, however, is the fact that the trolley is not used as an auxiliary to the feeding cable, and the capital cost of the installation may thus be greatly increased.—Lond. *Electrician*, July 23.

*Single-Phase Traction.*—R. M. Deely.—Notes on the results obtained with single-phase working on the Heysham-Morecambe branch of the Midland Railway, in England, during the last 15 months. Figures on test runs are given, the energy consumption per ton-mile being 99.3 watt-hours. The conditions are not typical, however, of suburban service, but figures are given showing that 83.83 watt-hours per ton-mile might be expected under these conditions if the gear ratios and wheel dimensions were altered. The opinion is expressed that the results, if only from the energy point of view, is favorable to single-phase as compared with direct current. As to weight, the single-phase equipment is about one-third heavier than the corresponding direct-current equipment, but when the whole train is taken into consideration the additional weight amounts to only about 7½ per cent. This difference would be considerably reduced if the rolling stock were made for through running.—Lond. *Electrician*, July 30.

*Surface-Contact System.*—An illustrated article on a recent demonstration of the Suchostawer surface-contact system on an experimental track in London. In this system the switches in the studs are held off by a heavy iron plunger, which is lifted by the car magnet. No springs are used, a long break is secured, and there is no continuous conduit to require ventilation.—Lond. *Elec. Eng'ing*, July 22.

### Installations, Systems and Appliances.

*British Central-Station Account.*—The report and accounts of the Poplar Electricity Works record increased load in all departments except public lighting, where there has been a slight decrease due to the introduction of metallic-filament lamps. The costs per kw-hour sold have also decreased, and are now 2.84 cents per unit or, without capital charges, 1.598 cent.—Lond. *Elec. Eng'ing*, July 22.

*Rheostat Control.*—A. E. Button.—The first part of an illustrated serial on the fundamental principle of rheostat control. The author deals with starting rheostats for direct-current and alternating-current motors.—*Gen. Elec. Review*, August.

### Wires, Wiring and Conduits.

*Underground Cables.*—De Marchena.—The conclusion of his long Marseilles congress paper. The author discusses the limitations in the use of underground cables and gives a comparison of the cost of underground cables and overhead wires.—*La Houille Blanche*, July.

*Aluminum-Copper Cables.*—A note on a recent British patent of C. J. Beaver and E. A. Claremont (20,447, 1908; July 22, 1909). They propose the construction of cables with conductors composed partly of copper strands and partly of aluminum strands. The aluminum strands are placed outside in cases where the insulating material is india rubber, as it is found that aluminum has less deteriorating action on india rubber than has copper.—Lond. *Elec. Eng'ing*, July 29.

*Transmission-Line Constants.*—D. B. Rushmore and M. W. Franklin.—A second set of tables of transmission-line constants, giving the charging current, single-phase, for 25 cycles, 60 cycles and 100 cycles; the inductive reactance, three-phase, for solid conductors for 25 cycles, 60 cycles and 100 cycles.—*Gen. Elec. Review*, August.

### Electrophysics and Magnetism.

*Electronic Theory of Metals.*—E. Riecke.—A paper read before the German Bunsen Society on "the present conceptions of the nature of the metallic state" from the viewpoint of the electronic theory. The author reviews both the accomplishments and the shortcomings of the electronic theory. The different values, obtained by different methods, for the densities of free electrons agree very well together. The same is true for the values found for the diameters of metallic atoms. An interesting result is the periodic character of electronic density and of atomic diameter. These positive results are encouraging, but there are still many discrepancies in the theory.—*Phys. Zeit.*, Aug. 1.

### Electrochemistry and Batteries.

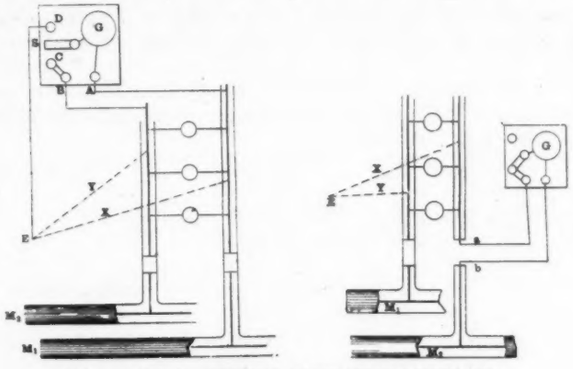
*German Bunsen Society.*—A review of the proceedings of the last annual convention. Papers by E. Riecke on the electronic theory of metals and by G. Tammann on the constitution of metallic alloys are printed in full. Other papers are reported in abstract. M. Le Blanc recommended the use of nickel wire instead of platinum wire as resistor material in electric laboratory furnaces for temperatures below 1000 deg. C. E. Cohen

described apparatus for making chemical and electrochemical tests at pressures up to 1000 atmospheres, especially for the study of the effect of a change of pressure on the e.m.f. of cells and on the solubility of salts in water. R. Amberg reported on a modification of carborundum, the so-called silundum, which has already been described in this paper; it is used chiefly for electric heating apparatus. M. Seddig described a new bolometer.—*Phys. Zeit.*, Aug. 1.

*Electric Steel Furnaces.*—W. RODENHAUSER.—A fully illustrated paper on electric steel furnaces, with special reference to the Roechling-Rodenhauser furnace, which is a combined inductive and electrode furnace.—*Metallurgie*, July 22.

**Units, Measurements and Instruments.**

*Testing Insulation Resistance.*—R. G. ALLEN.—A paper read before the Dublin Section of the (British) Inst. Elec. Eng. on testing the insulation resistance of live cables on direct-current systems by the Kelvin testing set. The circuit shown in Fig. 4



FIGS. 4 AND 5.—TESTING INSULATION RESISTANCE.

is supposed to be one of the sections fed from the main cables $M_1$ and $M_2$. $A$ and $B$ are the ends of the connections from the cables to the two terminals of the testing set ordinarily used for the battery. The terminal $D$ is earthed. The insulation resistances $X$ and $Y$ of the cables are represented by the dotted lines. The test is conducted thus: With $G$ suitably shunted, place $S$ on $C$ and read the deflection. Multiply the latter by the shunt value used and then call this number $D_1$. Repeat a like operation with $S$ on $D$ and so obtain $D_2$. Leaving $S$ on $D$, interchange the positions of the ends $A$ and $B$, and find $D_3$ in the same way as the other two values. Then the insulation resistances are given by

$$X^1 = \frac{D_1 - (D_2 + D_3)}{D_3}\, G \text{ and } Y^1 = \frac{D_1 - (D_2 + D_3)}{D_2}\, G,$$

where

$$X^1 = \frac{Xx}{X+x} \text{ and } Y^1 = \frac{Yy}{Y+y},$$

$x$ being the insulation resistance of cable $M_1$ and all the right-hand cables of the other live sections attached to it; $y$ being the similar value for $M_2$; and $y$ will be found by the method just described after first cutting out the section shown in the diagram, and joining $A$ and $B$ to two connections, one on each of the cables $M_1$ and $M_2$. To determine the insulation resistance between the cables, first switch off all the lamps in the section and connect as shown in Fig. 5. The galvanometer $G$ will now act as a sensitive ammeter—reading, if necessary, to a value as low as 1/600 milliampere. $X$ and $Y$ are supposed to have been determined by the previous method. Let $S$ represent $X+Y$, and $Z$ be the insulation resistance between the cables to be determined. Then, if $D$ is the deflection of $G$ suitably shunted,

$$\frac{E}{G + \dfrac{ZS}{Z+S}} = kD,$$

$E$ being the potential difference between the mains measured by a voltmeter. Now remove the ends $a$ and $b$ and connect them to a few storage cells of voltage $E_0$. Then, leaving the same shunt on $G$ as before, read the deflection $D_0$ and $\frac{E_0}{G} = kD_0$.

From these two equations and the values found for $X$ and $Y$ the value of $Z$ can be easily found. The application of the method on two-core cables, concentric cables and for determining the insulation resistance between two conductors of a three-wire system is described.—Lond. *Electrician*, July 16.

*Unreliability of the Flicker Photometer.*—L. W. WILD.—A note on the photometry of differently colored lights. The author has made comparative tests of tungsten lamps and carbon lamps by means of three flicker photometers and three other photometers. The tests were made by comparing the light from a tungsten-filament lamp taking 1.5 watts per candle against that of a carbon-filament lamp taking about 4.5 watts per candle. The following table gives the maximum, minimum and mean scale readings obtained with all six photometer heads:

| | Flickers. | | | Contrast. | Equality. | |
|---|---|---|---|---|---|---|
| | Wild. | Whitman. | Simmance. | Bunsen. | Prism. | Lummer. |
| Max. read..... | 1.73 | 1.735 | 1.735 | 1.86 | 2.05 | 2.00 |
| Min. read..... | 1.72 | 1.715 | 1.71 | 1.79 | 1.72 | 1.70 |
| Mean read..... | 1.725 | 1.725 | 1.72 | 1.825 | 1.85 | 1.83 |

"All three flickers give almost the same mean reading, although they differ as to sensitiveness. The Bunsen, Prism and Lummer heads again agree together exceedingly closely on their mean readings, but the reading is no less than 6 per cent greater than that obtained with the flickers. It would appear from these tests that in spite of the greater sensitiveness of the flicker photometer, it will have to be discarded in favor of the Bunsen disk." . . . "The conclusion from these tests is that for testing tungsten lamps against carbon lamps a flicker head must not be used. Equality-of-brightness photometers, on the other hand, fail on the score of insensitiveness, and contrast photometers of the Bunsen type alone fulfil the required conditions, though it is a pity that the sensitiveness of the flicker type cannot be equaled."—Lond. *Electrician*, July 16.

*Measurement of High Inductions and Properties of Iron-Silicon Alloys.*—E. GUMLICH.—An abstracted Bunsen Society paper in which the author describes a modification of Ewing's isthmus method, as used in the Reichsanstalt for tests of iron and alloys at high induction. A series of samples of iron-silicon alloys with varying content of silicon (up to 8.3 per cent) were tested; the magnetic saturation values decrease up to about 5 per cent Si in direct proportion to the silicon content; the author concludes that the beneficial effect of silicon on the magnetic properties of iron must be indirect. The specific electric resistance increases up to 5 per cent Si, proportionally to the silicon content, while the temperature coefficient of the resistivity decreases regularly according to a hyperbolic formula. The effect of the carbon content is still to be investigated.—*Phys. Zeit.*, Aug. 1.

*Ampere-Hour Standards.*—H. S. HATFIELD.—An abstract of a Bunsen Society paper on practical amp-hour standards. In spite of the great practical importance of measuring amp-hours, there do not yet exist standards which could be compared to the manganin resistor or to the standard cell with respect to constancy and ease of calibration. The usual voltameters, like the silver voltameter, have many disadvantages; their application is restricted, since they cannot be calibrated by government bureaus. Mechanical meters are too inaccurate and too complicated and variable for scientific purposes. The author thinks that voltameters, completely enclosed in glass and operating on the principle of electrolytic action, would be suitable practical standards, the volume of the evolved gases being read off directly. The accuracy which can be obtained is not very high—about 0.1 per cent to 0.2 per cent. The author described the new mercury voltameter of Schott & Company, a hydrogen voltameter of Hookham & Holden, and a new bromine voltameter. The mercury voltameter has a sensitiveness of 0.01 amp-hour per millimeter of scale, the bromine voltameter a sensitiveness of 0.00015 amp-hour per millimeter of scale.—*Phys. Zeit.*, Aug. 1.

*Meter and Relay Connections.*—H. W. BROWN.—The conclusion of his long illustrated serial on meter and relay connections. In this installment the author discusses relays adopted to special uses, and especially protection against short-circuits and grounds, also protection against both overload and short-circuit.—*Elec. Journal*, July.

*Circuit-Breakers.*—An illustrated description of a new time-limit device for circuit-breakers. It consists essentially of a partially toothed quadrant-gearing, with an escapement. The escapement allows the quadrant to move only at a certain speed until it becomes disengaged and releases the breaker, or until the load becomes normal again. The time element is practically constant for any pull. The device is calibrated for four time lags—namely, 3, 5, 10 and 15 seconds.—Lond. *Elec. Eng'ing,* July 15.

*Pyrometers.*—G. K. Burgess.—An account of an investigation carried out at the Bureau of Standards on the estimation of the temperature of the surfaces of molten copper by means of optical pyrometers or radiation pyrometers.—*Electrochem. and Met. Industry,* August.

### Telegraphy and Telephony.

*Telephone Cables.*—B. S. Cohen.—A paper on the most economical combination of capacity and inductance in underground telephone cables. The author criticises severely some results recently obtained by Devaux-Charbonnel, and especially his opinion that if the thickness of the dielectric in an underground paper cable is doubled, thus decreasing the capacity and increasing the inductance, the results would be superior to those obtained by increasing the inductance by means of Pupin coils. The present author concludes that Charbonnel's assumptions as to the increased transmission value of low-capacity cable cannot be upheld. The reduction of cable capacity is also an extremely costly matter, by reason of the increase in diameter of cable per unit number of wires, which not only increases the cost of the cable itself, but also of the duct into which the cable is drawn.—Lond. *Electrician,* July 23.

*Telephony.*—Devaux-Charbonnel.—A continuation of his long serial. The author discusses some cases of particular practical interest. In an overhead telephone system in a city efficiency of sound transmission depends not so much on the line as on the apparatus. In underground systems this is true only for distances less than 3 km or 4 km (2 miles or 2.5 miles). The author then passes over to a discussion of long lines and the damping coefficient.—*La Lumière Elec.,* July 24.

*Telefunken System.*—W. H. Eccles.—A critical analysis of the alleged advantages of the new telefunken system of wireless telegraphy. "The genuine improvements contributed to the technology of wireless telegraphy consists of the extreme stranding of the conductors carrying heavy oscillatory currents, and the employment of more frequent sparks than are usually used by the originators of the singing spark. An elevated capacity can emit little-damped waves conveying considerable total energy per second. These improvements, taken by themselves, are amply sufficient to account for the inferiority of the old Telefunken apparatus as compared with the new, without invoking the copper-mica plate spark-gap or any of the numerous devices that might replace it. Finally, it seems inevitable that in the effort to increase the power of emission to greater values the Telefunken Company will be obliged to reinstate the coupled reservoir-circuit which it has lately taken such pains to eliminate, unless it is prepared to erect gigantic antennas."—Lond. *Electrician,* July 30.

## BOOK REVIEWS.

Moody's Manual of Railroads and Corporation Securities. Tenth Annual Number. 1909. New York: Moody Manual Company. 3300 pages. Price, $12.

Moody's Manual for 1909 exceeds in volume the former issue by 300 pages, containing in all 3300 pages. Many new corporations are listed, and the data in regard to many others are much fuller than in the previous edition. In addition to the statistical information, the new edition contains a series of signed articles which are in reality analytical criticisms relating to the value of the securities of 100 of the most important railroad systems of the country. These were written by Roger W. Babson, the well-known statistician. The book is well indexed, making it an easy reference work.

Grounded Electric Transmission and Electrolytic Corrosion. By J. Stanley Richmond. Toronto: *The Canadian Engineer.* 69 pages, illus. Price, 50 cents.

This pamphlet is a reprint of articles contributed to *The Canadian Engineer,* in which the subject of the electric railway ground circuit is dealt with under various heads. Considerable of the space is devoted to methods of potential surveys, some of which are elucidated in detail. A section is devoted to rail-joint bonding and another to means for lowering track drops.

Saladature Autogene dei Metalli. By S. Ragno. Milano: Ulrica Hoepli. 129 pages, 18 ills. Price, 2 lire.

This little volume discusses in a simple but technical and impartially scientific manner the subject of autogenous soldering—that is, the soldering of one piece of metal to another of like physical and chemical character, as, for instance, lead to lead, aluminum to aluminum, and so on. The various methods employed industrially for autogenous soldering are discussed and classified. The book is a useful little guide to the processes in general use for soldering and will be of service to engineers.

Atlas der Elektropathologie. By Dr. S. Jellinek. Berlin and Vienna: Urban & Schwarzenberg. 92 pages, 96 plates, 246 ills. Price, 35 marks.

The author, who is a privatdozent at the University of Vienna, divides his work into three sections. The first part is devoted to accidents to human organisms due to electric currents; the second, to damages to circuits or material which introduce a life hazard, and the third, to losses attributed to lightning. The text is not voluminous, being merely a narrative giving the complete history of cases cited, special emphasis being placed on the clinical, forensic and sanitary aspects of each. As Mark Antony showed the Roman populace the wounds of Cæsar and bade them speak for him, so the author shows color plates of wounds, burns and rent wearing apparel and lets them tell the greater part of the story. He is careful to state that electric circuits are so safeguarded that the majority of fatalities are due to carelessness or to non-observance of printed rules; and that the percentage of accidents due to electrical causes is very much less than those due to gas, steam or other forms of energy. The work is doubtless of value to medical libraries, museums and to those interested in safety appliances and measures.

Les Industries Electrochemiques. By Jean Escard. Paris: Librarie Polytechniques, Ch. Beranger. 773 pages, 332 ills. Price, 25 francs.

In the introduction of this work the author lays emphasis on the fact that the work is to be concerned purely with industrial electrolysis. He adheres rather closely to this idea throughout the text, though some question might arise as to the relevancy of the chapters on the production of ozone and nitric acid and such apparatus as frequency indicators. Like many other compilations of this magnitude, a lack of intimate knowledge of many of the processes makes itself evident. In several cases obsolete information is given as to recent practice, and the illustrations of a copper refinery, a nickel-plating plant and various types of electrical machines used in the different branches are mostly out of date. The work is of little value as representing American practice and in cases certainly does not do justice to foreign practice.

The book is divided into 10 chapters, and the bulk is taken up with descriptions of the industrial preparation of salts and the obtaining of metals. Three chapters in particular commend themselves to the reader, the subjects being the production of ozone, nitric acid and applications in the field of organic chemistry. In every way these are modern treatises on their respective subjects and contain much information not found in most works of this character. There is nothing in the work which cannot better be taken from the multitude of special treatises on industrial electrochemistry, but for a summary of all the more important processes and many lesser ones the book should find place in the library of all discerning electrochemists.

CONTADOR DE ELECTRICIDAD. By Victor Mauri. Madrid: José Corrales. 91 pages, illustrated.

This little pocketbook is one of the few treatises on electricity or electrical applications in the Spanish language that come to these shores. It describes an electrolytic meter of electric current (ampere-hours) for direct-current installations, called the Krumer meter. The book is suitable for the use of those who desire to test or to operate meters.

ANNUAIRE POUR L'AN 1909. Bureau des Longitudes. Paris: Gauthier-Villars. 710 pages, with appendix. Price, 1 fr. 50.

This annual volume carries its usual welcome message. The great value of the Annuaire is that it is an official publication of the French Government. The Bureau des Longitudes was established by the French Revolutionary Government in 1795 and charged with the duty of studying and perfecting the applications of the sciences of astronomy and geography to navigation and physical geography. The result has been that tables were published by the Bureau at regular intervals in a little annual volume, the Annuaire, which has continued to this day. The Annuaire includes a great variety of subjects and is now divided into two volumes, which appear alternately in successive years. This particular volume relates to the solar system, geography, meteorology, etc. It is one of the most important publications of the French Government.

ELECTRIC FURNACES. By Wilhelm Borchers. Translated by H. G. Solomon. London: Longmans, Green & Company. 218 pages, 282 ill. Price, $2.50.

The name of Dr. Borchers coupled with a work on electric furnaces should need no further comment as to its standard, and this book represents the author at his best. It is a careful translation of the second German edition of "Die Elektrischen Ofen," containing as an appendix a description of the Girod and the Rochling-Rodenhauser furnaces, two important types developed since the publication of the German edition. In this work furnaces are divided into four principal types: direct and indirect resistance and arc furnaces, and practically all commercial forms so far devised are described and illustrated. The author's readily convertible laboratory furnace is treated separately. Chapters on the construction and the output of electric furnaces make this book unique in electric furnace literature, enabling it to take place as a work on design. The cuts and the descriptive matter are above criticism and the book will find place as a standard in every establishment having to do with this type of heating appliance.

# NEW APPARATUS AND APPLIANCES

## Hydro-Electric Equipment of the Reedy River Power Company.

The hydro-electric installation illustrated herewith is situated on the Reedy River in South Carolina. The stream flow is

FIG. 1.—REEDY RIVER POWER STATION.

about 110 cu. ft. per second, all of which is utilized. A reservoir capable of storing 16,500,000 cu. ft. has been created by the erection of a stone dam 38 ft. in height, 618 ft. in width, with

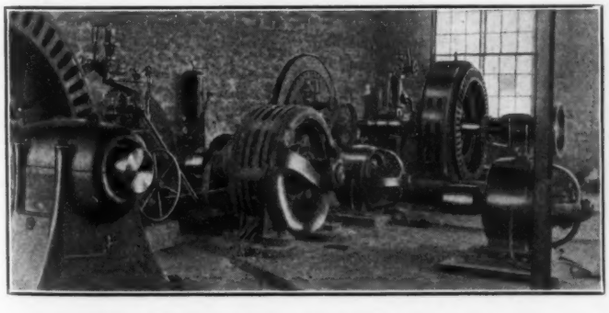


FIG. 2.—INTERIOR VIEW OF REEDY RIVER PLANT.

a thickness of 40 ft. at the bottom and of 12 ft. at the top.

No canal is used in leading the water from the reservoir to the turbines, each of which receives water through an individual flume 125 ft. in length, protected at the intake from floating trees, timbers, and débris by a heavy iron rack. The turbines are of the horizontal type, manufactured by the S. Morgan Smith Company. The generator equipment, which will furnish 2300-volt, 60-cycle, three-phase current, consists of one 300-kva and two 600-kva alternators, which receive their excitation from two 35-kw, 125-volt, direct-current generators.

The transformers used for increasing the e.m.f. to 23,000 volts for transmission are situated in a separate room and are of the oil-insulated, water-cooled type. The water for this purpose is led from a tap in one of the flumes to a settling basin on the side of the hill, and from there to the cooling coils of the transformers. The 2300-volt oil switches are of the remote control type. They are operated by means of bell cranks and levers, mounted on a control board situated in the generator

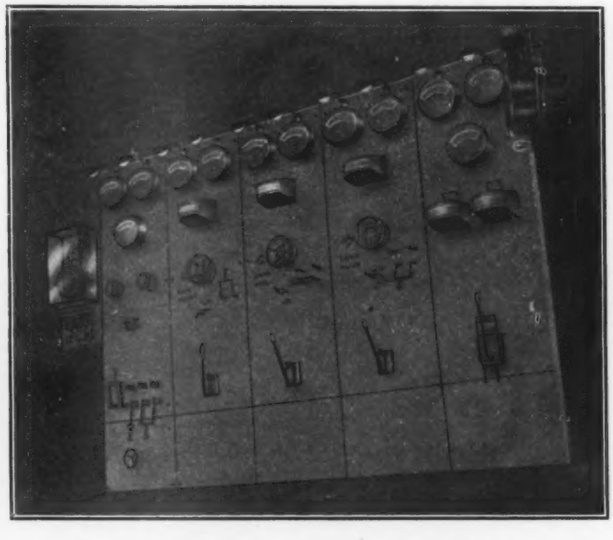


FIG. 3.—SWITCHBOARD, REEDY RIVER PLANT.

room. Here are also situated the field rheostats used for the voltage regulation of the generators. No high-tension wires are brought out here, all instruments being operated through potential and series transformers.

The transmission line, which extends in almost a straight line from the power station to Laurens, is made up of three-stranded aluminum cables, each of which has a conductivity equal to that of a No. 1 copper wire. The danger from lightning has been provided against by three-stranded steel wires stretched above the conductor and grounded at every third pole.

Shortly after the dam had been completed and while the machinery was partially installed, a heavy rain produced a flood which completely inundated the power station. When the water receded it was found that the river had gouged out an entirely new path, leaving the station high and dry at a considerable distance from the river. A long embankment of masonry had to be constructed in order to shift the river back to its original course. Although the machinery was submerged some 18 hours, the plant was in operation within a short time after the flood.

The generators and transformers for the equipment were built by the Crocker-Wheeler Company, Ampere, N. J.

## Electrical Equipment of the Loray Textile Mill.

In connection with the textile industry electric transmission and motor drives have of late received considerable attention. On account of some of the peculiar features of this industry

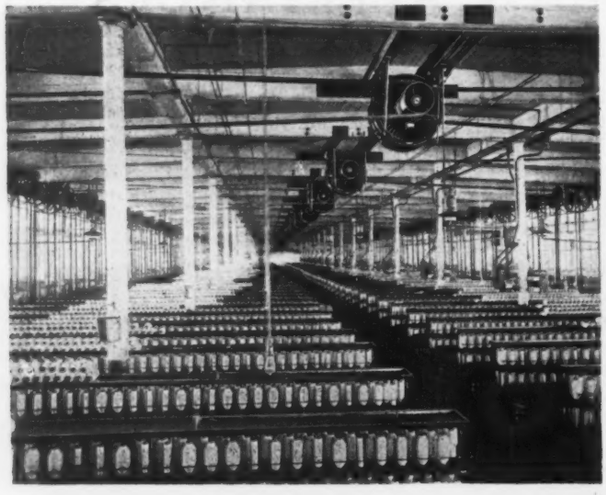


FIG. 1.—SPINNING ROOM, LORAY MILL. 14 75-HP MOTORS.

inherent in the nature of the material handled, the working out of the application of these motors is a matter of interest. One of the largest mills in the South which has made this change is Loray Mill, located at Gostonia, N. C. This mill, which was formerly driven by steam engines with rope transmission in connection with lineshafts, is now operating successfully by electric motors throughout. The Loray Mill has 37 motors in operation with an aggregate rating of 3000 hp. The motors are all three-phase, 60-cycle, 2200-volt Hawthorn induction motors, manufactured by the Western Electric Company, and the Southern Power Company supplies the energy.

It was the experience of the company with rope transmission which caused it to change to electric transmission and motor drive. The principal reason, and the one which is causing rope-driven installations to be replaced by motor-driven equipments, is continuous operation. In large plants shutdowns for repairs of ropes frequently last for from one to two days. The energy consumed must also be kept down to the lowest possible point. Electric motors have come nearest to fulfilling the requirements of continuous operation and low energy consumption. The man standing at the switchboard in the engine-room or at the distributing board is able to tell at once by simply looking at his indicating or recording instrument when the amount of energy is increasing over that required for normal operations. By inserting indicating meters in a motor circuit, checks can be made on each individual operator's work and the processes made a scientific study.

The size of the Loray Mill makes it an excellent example of a motor-driven equipment, since approximately 58,000 spindles and 1650 looms are driven by electrical motors. Fig. 1 shows a view in the spinning-room of this mill. In this section are installed 14 75-hp motors suspended from the ceiling in a row

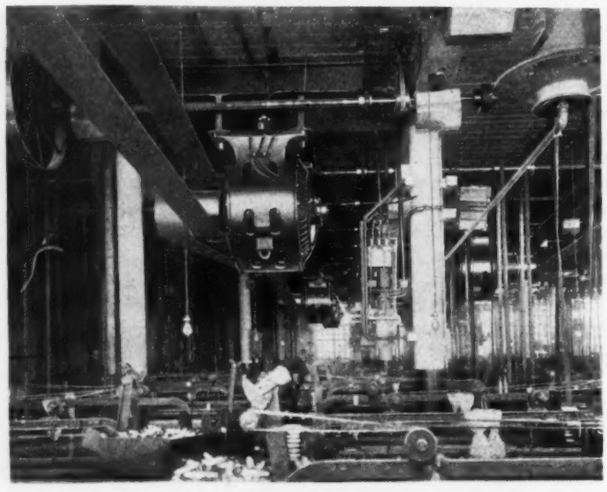


FIG. 2.—WEAVE ROOM, LORAY MILL. 5 125-HP MOTORS.

extending down the center bay of the section. Each of these motors has two pulleys attached from which two belts extend in opposite directions to countershafts extending down each

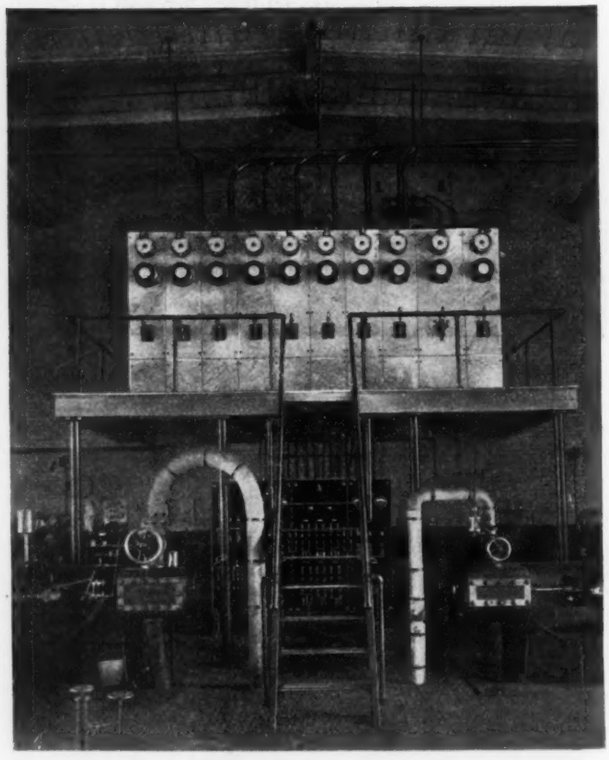


FIG. 3.—SWITCHBOARD, LORAY MILL.

side of the bay at the end of the two rows of spinning frames. As already stated, this mill changed from steam drive and rope transmission to electric drive throughout, so that the shafting and methods of operating by the former equipment remain the same as originally installed. The change, therefore, occasioned a minimum of expense, which consisted principally of the motor equipment, wiring and changes in belting.

The method of drive and the two-pulley attachment are shown somewhat plainer in Fig. 2. In each case the motors are rigidly secured to beams, which are in turn fastened by bolts to the floor beams. This scheme of support is shown in Figs. 1 and 2. In the weave room (Fig. 2) five 125-hp motors are installed, each operating two groups of frames in the same manner as shown in Fig. 1. Mounted on a column at the right of each of these motor installations are the starting and controlling devices. Each motor is equipped with an auto-starter and line panel, the line panel being equipped with a three-pole, single-throw, automatic oil switch.

The 10-panel switchboard used in connection with this motor installation is shown in Fig. 3. Each panel is equipped with the necessary indicating meters and an oil switch. In the foreground may be seen the steam engines connected to direct-current generators. This equipment was formerly used to light the mill, but is now idle since both lamps and motors are supplied with energy from the Southern Power Company's circuits.

## Electrically Driven Shovels.

What are said to be the largest electrically operated shovels ever constructed, having buckets holding 4 cu. yd., and equipped with Westinghouse motors and automatic control, have recently been placed in the service of the Dolese & Shepard Company, of Chicago, for mining rock in its limestone quarries. The hoist

ELECTRICALLY DRIVEN SHOVEL.

movement of these two 110-ton machines is actuated by a 200-hp, 220-volt, series-wound, direct-current mill motor running at 415 r.p.m.; the thrust motor, controlling the movement of the dipper handle, is an 80-hp machine of similar type; while the swing boom is operated by an 80-hp motor. Each motor is controlled independently by an automatic magnetic switch controller, which secures the greatest nicety of operation of the heavy bucket. This form of control protects the motors from any heavy overloads which may result from the bucket striking solid rock or other obstructions, by opening switches to introduce resistance into the motor circuit. The control panels and resistances are mounted in the rear of the cab, while the controller handles are conveniently placed under the hand of the operators. The hoist and swing-boom motors are mounted within the car. The thrust motor is placed out on the boom, communicating its motion to the bucket staff through reducing gearing connected to a pinion engaging a rack on the staff. The circuit to the shovel is completed through a feed cable, carried on a retractile reel on the shovel cab, and through the rails on which the shovel advances. The shovel may also be fitted with a standard trolley and may then attain a speed of five miles an hour. Compared with the steam shovel, the electrically-driven excavating apparatus has been found to present marked advantages of simplicity, economy and ease of operation. The hauling of water and coal is avoided, fewer operators are required to handle the machine, and a considerable saving of time is noted.

## Motor Equipment of Borland Manufacturing Buildings, Chicago.

The new Borland Manufacturing Buildings will be located at 114-142 Federal Street, Chicago, between Harrison and Polk streets. There will be five of these buildings, all 100 ft. x 100 ft. in ground dimensions. The two end buildings will be eight stories high, and the center one nine stories high. The individual buildings are placed 26 ft. apart so that there is space for light and air around them. However, there will be a one-story or two-story building connecting each of the large buildings, so that there will be one continuous building at the street level. Excavation for the three middle buildings has been begun. In the center building will be an 800-kw isolated electric generating plant, which is laid out to provide for the three buildings which are now under way, although space is left for future increase in plant equipment by the addition of two generating units of 400 kw or 500 kw each, as required when the remaining two buildings are erected, or, indeed, before that time if the demands of tenants should make the extension necessary. The buildings are designed for the use of printers, electrotypers and allied crafts, and the plant will furnish the electricity to operate the motors of tenants, as well as to light the building. The initial plant will consist of three units, one of 400 kw, one of 250 kw and one of 150 kw. All will consist of Corliss engines directly connected to 250-volt direct-current generators. The engines will be supplied by the Nordberg Manufacturing Company, of Milwaukee, and will be of the cross-compound type for the large units, with a simple engine for the 150-kw generator. The generators are furnished by the Sprague Electric Company, of New York, and are steel-frame machines. The plant will be equipped with 1600 hp in boilers, there being four 400-hp units, with space for an additional unit when needed. The boilers are supplied by the Edge Moor Iron Company, of Edge Moor, Del. There will be Green chain-grate stokers and a brick stack 185 ft. high and 88 in. in diameter. The building is of reinforced-concrete construction, with brick walls. The feeders from the switchboard will lead upward through vertical shafts, and tenants will make their own wiring connections to them. The plant will be operated day and night, and it is expected that the 150-kw generator and one boiler will, for the present, take care of the night load. Pierce, Richardson & Neiler are the consulting engineers for this interesting isolated industrial plant.

## Arc Regulating Rheostat.

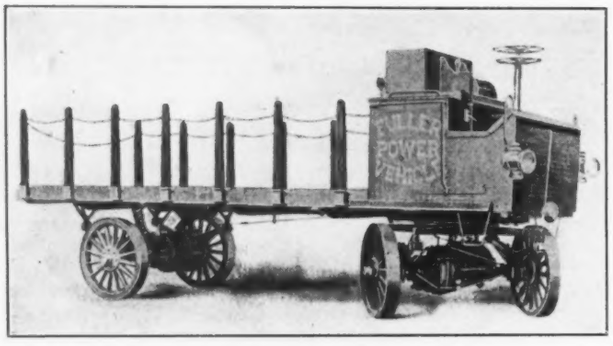
In the accompanying illustration is shown a rheostat designed for the regulation of projector and search lanterns by the adjustment of the voltage across the arc. The resistor consists of enameled units in which the wire is sealed from the dis-

ARC REGULATING RHEOSTAT.

integrating effects of the atmosphere. It is said that these units can be worked at very high temperatures without injury. This type of rheostat has been placed on the market by the Ward Leonard Electric Company, Bronxville, N. Y.

## Gasoline-Electric Truck.

The truck shown herewith, and built by the Fuller Power Truck Company, of Delphos, Ohio, is made entirely of steel, even to the tires. A water-cooled gasoline engine direct-connected to an electric generator furnishes the necessary energy for driving four motors, one for each wheel. The operator regulates his power and speed by his control of these motors, as the engine and generator act automatically in response to that control. The engine and dynamo rest on a base fastened to the




GASOLINE-ELECTRIC TRUCK.

platform under the seat of the driver, and every part of the apparatus is accessible.

The truck may be turned completely around in practically its own length. The wheels are of the artillery type, and all bearings are of navy bronze and automatically oiled. The engine and generator take the place of storage cells. The actual rating of each motor is 3.75 hp, but for shorter periods each motor will furnish 2½ times its normal horse-power rating without injury to construction.

The forward end of the vehicle is supported on a fifth wheel or turntable having ball bearings of a size and strength capable of sustaining the heaviest loads under any conditions of the truck's service. On the lower half of this turntable the steering sector is secured, enabling the operator to move the forward axle with its driving power in either direction from a straight line to a degree, allowing the truck to be turned completely around in practically its own length. In this steering movement either the forward-axle electric motors only may be used or the forward and rear-axle motors.

The springs are of the semi-elliptic type tested to sustain a load of 5000 lb. per spring on a 4-in. deflection. These springs, four in number, two in front and two in the rear, on the same deflection maintain a load of 20,000 lb., making them well able to meet the demands of the carrying capacity of the truck.

The axles are of very high grade of steel, and each one of the four wheels forms a point of traction. Should one of the wheels slip, therefore, the remaining three are still in service. By this means of obtaining motion the vehicle is relieved from all detrimental strains, as the working power is more evenly distributed. The control of this truck has been so worked out that the starting torque is not more than the running torque. This is accomplished by a special winding of the generator with its controller. A truck of this kind obviously possesses a number of advantages.

## Return Trap System of Boiler Feeding Without Pump or Injector.

As is well known, the return trap is a device which receives the water of condensation from whatever source, and automatically delivers it into the boiler at practically the temperature due to the pressure at which the steam is condensed. The type of trap shown in the accompanying cut, known as the "Detroit" return trap, will, it is claimed, deliver water at a temperature higher than a pump will lift. The pressure is admitted to the surface of the water, and is automatically shut off before the tank is empty. The steam used is only such as is condensed by the latent heat passing from it into the water in the tank, which is all put back into the boiler.

When the steam pressure carried on a heating system is 10 lb. to 15 lb. or more, it is only necessary to employ one

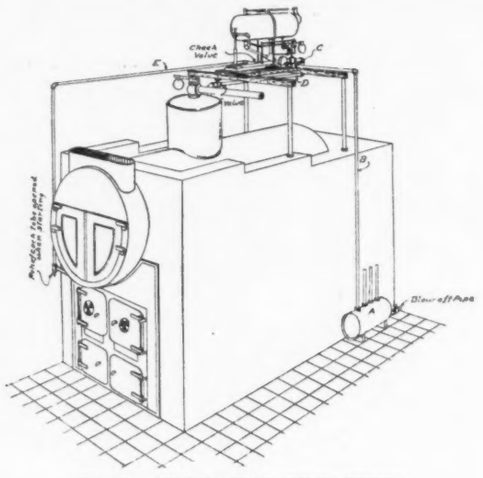


FIG. 1.—RETURN TRAP BOILER FEEDER.

"Detroit" return trap and receiver. All the returns from whatever source are brought into the receiver *A*. For every pound of steam carried on the system, water can be lifted 2 ft. The trap is set perfectly level at any convenient point about 4 ft. above the water level of the boiler and as near to it as possible. The water is raised through the pipe *B* and a check value *C* into the trap tank, which normally stands in a horizontal position. As the tank becomes filled with water, it tilts over, engaging with a lever which automatically admits live steam from the dome of the boiler over the surface of the water in the tank, thereby equalizing the pressure with that within the boiler. The water thereby is allowed to flow directly

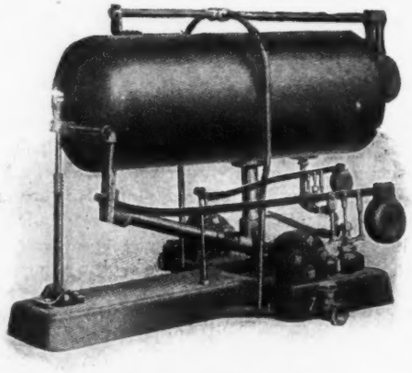


FIG. 2.—RETURN TRAP.

into the boiler by gravity. As the trap tank becomes empty, it is tilted back into its normal position by a weighted arm, and the process of refilling and dumping is repeated.

In manufacturing plants where exhaust steam is used for heating and drying, all the returns can be brought to a receiver and trap located where all the lines will be drained by gravity. The trap below is then employed as a water lift to the trap above the boiler. With this double-trap system no other means of boiler feeding is necessary. This type of trap is also perfectly adapted to the draining of live or exhaust steam headers, and an adaptation is made for systems carrying a vacuum. The trap described is made by the American Blower Company, Detroit, Mich.

# Industrial and Commercial News

## Commercial Intelligence.

### THE WEEK IN TRADE.

Business conditions have rapidly adjusted themselves to the new tariff schedules and the result has been a very apparent increase in commercial transactions. The jobbing houses report a satisfactory number of buyers in the market and say that orders are being placed more liberally than at any time since 1907. The uncertainty as to the rates of duties being removed, retailers are prepared to lay in the heavy stocks that the promised prosperity of the consumers seems to make necessary. The crop reports continue to improve and to indicate that there will be an enormous amount of money distributed among the farmers next fall and winter. This is taken to presage unusual buying and the retailers are preparing for the emergency. In industrial centers the evidence of prosperity is equally alluring. All branches of manufacture, but more especially in iron and steel and in textiles, report largely increased orders and expansion of operations. More men are being put to work every day, and many localities where the buying capacity of the public has been restricted are returning to normal. This encourages the retailer to lay in stocks. The only disturbing element in the situation is the unusually high level of commodity prices. The cost of living is at the present time higher than it has been at any time since the systematic compilation of such statistics was begun. This, of course, restricts the prosperity of the individual, especially of the wage earner. Among the encouraging features of the past week were the large orders for railroad equipment that came to light. Recent car orders amount to 25,000, the larger part of which are to be of steel construction. Collections have improved to some extent, but are naturally slow, as much of the commercial betterment is yet prospective. Failures for the week ended Aug. 12, as reported by *Bradstreet's*, were 219 as against 184 for the previous week, 249 in the same week of 1908, 146 in 1907, 143 in 1906 and 147 in 1905.

### THE COPPER MARKET.

During the past week there has been considerable speculative interest in the copper market, and transactions of this character have been quite liberal. The result of this has been a decided advance in selling prices and a material strengthening in tone. Producers and selling agencies have been holding out for higher prices, apparently being of the opinion that the favorable figures given out in the July report of the association would bring about an active demand. This has not been the case, so far as the actual consumers are concerned. During the past week there has been very little demand from melters, either at home or abroad, and the spot sales have mostly resulted in adding to the stocks in warehouses. From the best information obtainable it appears that the actual consumption of copper in this country during July was but little more than 50,000,000 lb. As the domestic deliveries are given as $75,520,083 lb., it is evident that there has been a heavy increase of stocks in consumers' hands. In the meantime it is known that stocks in foreign warehouses increased 22,000,000 lb. during the same month and have continued to increase rapidly during the first half of August. These facts are perfectly well understood by consumers and they cannot, therefore, be demoralized by the surprising statistics given out by the Copper Producers' Association. Actual sales on the Metal Exchange during the week were only fair. Imports continue to be liberal and exports for August, including Aug. 16, have amounted to 11,220 tons. The daily call on the Metal Exchange, Aug. 9, at 12:30 o'clock, quoted standard copper as follows:

| | Bid. per lb. | Asked, per lb. | Settling price, per lb. |
|---|---|---|---|
| Spot | 12.65 | 12.90 | ..... |
| August | 12.65 | 12.90 | 12.77½ |
| September | 12.75 | 12.90 | 12.82½ |
| October | 12.82½ | 12.90 | 12.87½ |
| November | 12.85 | 12.95 | 12.90 |
| December | 12.95 | 13.00 | 12.97½ |

The London prices Aug. 16 were as follows:

| | Noon. £ s d | Close. £ s d |
|---|---|---|
| Standard copper, spot | 59 17 6 | 59 15 0 |
| Standard copper, future | 60 17 6 | 60 15 0 |
| Market | Easy | Easy. |
| Sales of spot | | 500 tons |
| Sales of futures | | 1,400 tons |

Extreme fluctuations for this year:

| | Highest. | Lowest. |
|---|---|---|
| Standard | 13.05 | 12.72½ |
| Lake | 14.55 | 12.55 |
| Electrolytic | 14.25 | 12.12½ |
| Casting | 14.12½ | 12.00 |
| London, spot | £64 2 6 | £54 12 6 |
| London, futures | 64 17 6 | 55 10 0 |
| London, best selected | 67 15 0 | 59 0 0 |

BUTTERINE FACTORY ELECTRICALLY EQUIPPED.—The John F. Jelke Company, of Chicago, butterine manufacturer, is building a large new factory at Washtenaw Avenue and Polk Street in that city. All machinery in this factory will be operated by electric motors, and there will be an isolated 500-kw generating plant. This plant will consist of two 250-kw, 250-volt units of simple Corliss engines made by the Vilter Manufacturing Company, Milwaukee, directly connected to Sprague direct-current generators. There will also be a 50-kw dynamo of the same manufacture directly connected to an Ames high-speed engine, which will be used for night service. Practically all of the electricity generated in this plant will be supplied to electric motors, and the factory will be equipped with between 400 and 500 hp in motors for driving various kinds of machinery as well as electric elevators. Pierce, Richardson & Neiler, of Chicago, are the consulting engineers.

AUTOMATIC ELECTRIC COMPANY.—Announcement has been made by the Automatic Electric Company of Chicago, manufacturer of automatic telephones, that it can accept no further orders for delivery before Jan. 1. It is announced that the business booked for delivery within the next four months includes about 85,000 telephones and switchboards. The Havana installation must be in operation by December, and there are 16 cities in this country where the installations must be in readiness before the end of the year. Among the recent orders received by the company are two for 5,000 telephones each from Los Angeles and San Francisco. The former city now has 33,000 automatic telephones in service and the latter city is using 15,000 similar devices.

DAYTON GLOBE IRON WORKS COMPANY.—Among the recent orders of the Dayton (Ohio) Globe Iron Works are the following: two double-wheel units to Pine City (Minn.) Electric Power Company; single-wheel units to the Orion (Mich.) Light & Power Company, the West Milton (Ohio) Electric Company and the Camden (Ohio) Electric Company; one double and one single-wheel unit to the Osceola Light & Power Company, at Reed City, Mich. This last mentioned apparatus is to take the place of the present equipment of vertical trump wheel on mortise gear.

BALL & WOOD COMPANY ORDERS.—The United Electric Company, Chambersburg, Pa., has contracted with the Ball & Wood Company, Elizabethport, N. J., for two 750-kw Rateau-Smoot high-pressure turbines and 60-cycle three-phase generators, to be installed in its plant at Lemoyne, Pa. The United Electric Company is owned by the Cumberland Valley Railroad Company, and the latter is, in turn, controlled by the Pennsylvania Railroad. The specifications for these units were issued by the motor power department of the Pennsylvania Railroad.

DISTRICT HEATING SYSTEM IN INDIANAPOLIS.—The Indianapolis Light & Heat Company, of which C. C. Perry is vice-president and treasurer, is spending about $150,000 for a new exhaust-steam heating plant. The mains, which are being laid in the central business streets, will have a total length of about 15,000 ft. The American District Steam Company has the contract, secured by the Chicago office, for installing the new system. It is expected that the plant will be ready for service by Nov. 15.

RECENT CROCKER-WHEELER ORDERS.—The Crocker-Wheeler Company has recently booked several large orders for direct-current apparatus. One of these, from the Indiana Steel Company, calls for 70 mill motors, totaling about 2400 hp. This order is an addition to the 11,000 hp employed at the present time. An order from the Gould Paper Company, of Lyons Falls, N. Y., calls for electric drive for a new paper-making machine. A sale has been made to J. M. Kohler Sons Company, Sheboygan, Wis., of one 750-kw, 250-volt direct-current generator. Other sales are to the King Bridge Company, Cleveland, Ohio, one 150-kw, compound-wound, 250-volt generator; to the American Lace Manufacturing Company, Elyria, Ohio, one 100-kw generator; to the Bethlehem Steel Company, a 225-hp, compound-wound motor, to be installed at its Saucon plant; to Beadleston & Woerz, New York City, 187 hp in compound-wound, 115-volt motors and one 150-kw. 125-volt, compound-wound generator. Among orders for induction motors recently received is one from the Roessler & Hasslacher Chemical Company, Perth Amboy, which totals 295 hp in three-phase, 60-cycle, 480-volt motors of the squirrel-cage type.

WHEELER CONDENSER & ENGINEERING COMPANY.—At the recent annual meeting of the stockholders of the Wheeler Condenser & Engineering Company J. J. Brown was elected vice-president and general manager. Mr. Brown entered the condenser field some 15 years ago as Southwestern manager for the Henry R. Worthington Company and later became general sales manager. After the formation of the International Steam Pump Company he became its general Western sales manager with headquarters at Chicago, and resigned that position to take up his present work. The Wheeler Condenser & Engineering Company has recently introduced several important improvements in condensing apparatus, among which are the "dry tube surface condenser," which has shown satisfactory results in high vacuum work. The plant at Carteret, N. J., is being enlarged and improved. Among these improvements is a new power house which will be equipped with several different systems of condensers for exhibition purposes, as well as for supplying the electrical energy for the shop.

CONTRACTS FOR NORTHWESTERN RAILROAD TERMINAL, CHICAGO.—Work is proceeding steadily on the new passenger terminal of the Chicago & Northwestern Railway in Chicago, the electrical features of which were described in the issue of July 8. The contract for the conduit and wiring of this large railroad station has been awarded to Kohler Brothers, of Chicago, and will amount to over $140,000. This is one of the largest wiring contracts ever awarded in Chicago. The Kehm Brothers Company, of Chicago, is the contractor for the heating and ventilating equipment, the contract calling for the expenditure of nearly $275,000. The Link-Belt Company, of Chicago, will supply the coal-handling and ash-handling machinery in the power house at a cost of about $15,000. These contracts have been placed on the recommendation of Pierce, Richardson & Neiler, who are the consulting engineers.

OSBURN ELECTRIC COMPANY.—The Osburn Electric Company has been incorporated under the laws of Illinois, with authorized capital of $100,000, to do a manufacturing business. The factory of the company will be at 66 Fort Street, East, Detroit, Mich., and the Chicago office at 404 Great Northern Building. The company will make ignition apparatus for automobiles as well as small storage batteries and magnetos. It will also place on the market an ingenious electric lighter for gas stoves. The officers of the company are: President, H. G. Osburn; vice-president, J. C. Osburn; treasurer, Ralph G. Hutchins; secretary, F. E. Hutchins. H. G. Osburn, the president, is well known in electrical circles as the founder of the Osburn Flexible Conduit Company, and was formerly engaged in the storage-battery and electrical supply business in Chicago. R. G. Hutchins will have charge of the Chicago office.

COMMERCIAL CABLE COMPANY'S PROTEST.—George Gray Ward, vice-president of the Commercial Cable Company, has written a strong letter of protest to Sir Edward P. Morris, Premier of Newfoundland, against the repudiation by that Government of the contract made between the company and the former administration in the province. It is claimed that the present government in Newfoundland seeks to abrogate the contract with the cable company purely for political reasons, and the cable company, according to one of its officials, does not intend to interfere with its present arrangements without carrying the controversy to the House of Lords, if necessary. The cable company has already spent $1,000,000 under the contract and has made plans to spend as much more. Its officials claim that it is carrying out every feature of its contract.

WHITNEY HYDROELECTRIC COMPANY LITIGATION.—The United States Court in North Carolina has entered a judgment against John S. Henderson and C. W. Smith, receivers for the Whitney Company of Salisbury, for $325,000, in favor of the T. A. Gillespie Company, contractors, who built the large dam across the Yadkin River. This decision holds that the construction lien is prior to the mortgage held by the Bankers' Trust Company of New York, which secured the bond issue. It is understood now that the formal sale of the property will be made at an early date, and the purchasers will no doubt continue the work on which several millions have already been expanded.

WIRELESS ON LAKE SUPERIOR.—Contract has been closed by the United Wireless Telegraph Company with the Calumet & Hecla Mining Company for the erection of a wireless station near Calumet, Mich. The contract includes the erection of two 130-ft. towers on a hill 625 ft. above Lake Superior, enabling the station to command a sweep of the entire lake from Duluth and Port Arthur to Sault Ste. Marie. The contract calls for the exclusive wireless privileges on the peninsula. The Calumet & Hecla Company is contemplating establishing wireless stations at several of its mines, as well as equipping its ore boats.

VIRGINIA ELECTRIC TOOL & MANUFACTURING COMPANY.—In pursuance of a resolution of the board of directors, a meeting of the stockholders of the Virginia Electric Tool & Manufacturing Company has been called for the purpose of considering a plan to dissolve the old company and organize a new one with capital of $1,000,000 to carry on a greatly enlarged business, under the name of the American Electric Tool Company. The stockholders of the old company are to receive a good share of the stock of the new company in exchange for their old stock, provided the program be carried out.

WESTINGHOUSE TURBO-GENERATOR SET FOR BRIDGEPORT, CONN.—The United Illuminating Company, Bridgeport, Conn., is installing a Westinghouse 500-kw turbine for driving a 2400-volt, three-phase, 60-cycle Westinghouse alternator, which is to feed into the distribution system serving the city of Bridgeport and surrounding territory with light and power. The present installation is an addition to the existing equipment of a 300-kw Westinghouse turbine driving a Westinghouse alternator, besides several small belted units.

SOUTHERN POWER COMPANY.—The Southern Power Company is making ready to develop the water-power at Getty's Shoals, on the Catawba River, in North Carolina, 12 miles above Camden, and 25 miles south of Great Falls, where another large development is being finished. The Getty's plant will give 100,000 hp, it is estimated, while the dam will be over 100 ft. high, it is stated, with backwater running 20 miles up the river.

UNITED STATES LIGHT & HEATING COMPANY.—The newly organized United States Light & Heating Company, which was incorporated under the laws of Maine with $17,500,000 capital, reports that during the last month the company received orders to equip 240 cars, of which 88 are for the Western Pacific. The other orders came from the Santa Fé, Denver & Rio Grande, Ann Arbor, Minneapolis & St. Louis, Pennsylvania and Erie.

DEMAND FOR ELECTRIC HEATING APPLIANCES.—The Vulcan Electric Heating Company, of Chicago, reports an especially active demand for industrial electric-heating appliances, such as soldering irons, branding irons and curling irons. Its factory is so busy that, despite the utmost exertion, the company finds it difficult to make deliveries on time.

CATALOGS WANTED.—Smith, Kerry & Chace, consulting engineers, of Toronto and Winnipeg, who have recently opened offices at 68 McDougall Block, Calgary, Alta., in order to deal more conveniently with their business in that section of the West, would be glad to receive catalogs of electrical and engineering supplies at that address.

MOORE ELECTRICAL COMPANY, Newark, N. J., has received an order for three installations of the Moore tube lamp in Berlin, Germany. The necessary apparatus, which has been forwarded, will be installed by James A. Holt, who sailed for Bremen from New York Aug. 5.

# Financial Intelligence.

## THE WEEK IN WALL STREET.

The week has been one of continued buoyancy in the stock market. There has been practically no cloud on the horizon, and there has been every sort of news to stimulate the buyers. The August crop report indicated even a better state of affairs than the very favorable report of July had promised. There is no longer the slightest doubt that the producers will receive for their labors in 1909 vastly more than ever before in the history of the country. The reports from industrial sections indicate continued activity and such a volume of orders and inquiries that every wheel will be kept turning for months to come. The railroads, too, are showing the effects of the revival of business. Weekly returns are vastly improved, and with economical methods that were adopted during the period of depression, net earnings in many instances are making their best records. All of these things have boomed the market in Wall Street and have carried many stocks to unheard-of levels. The feature of the week was the sudden and spectacular advance in Union Pacific. This stock showed a net gain of more than 14 points on the week and touched the high water mark of 219. This advance was accompanied by well-defined reports that the shareholders were to receive participation crtificates in the earnings of other stocks held by the company. The money market has shown some symptoms of growing stronger. There was a better demand from the banks during the past week and rates were considerably stiffer. Quotations Aug. 16 were: Call 2@2½, 90 days 3¼@3½. The quotations in the table are those of the close Aug. 16.

NEW YORK.

| | Aug. 9. | Aug. 16. | Shares sold. | | Aug. 9. | Aug. 16. | Shares sold. |
|---|---|---|---|---|---|---|---|
| All.-Ch. ..... | 15¾ | 15½ | 1,600 | Int.-Met., pfd.. | 46½ | 46¾ | 24,100 |
| All.-Ch., pfd... | 56¼ | 53⅞ | 3,150 | Mackay Cos... | 83½ | 83* | 2,900 |
| Amal. Cop.... | 85⅜ | 85⅜ | 214,500 | Mackay Cos.,p. | 74¾* | 74½ | 225 |
| Am. D. T..... | 30* | 20½ | ——— | Man. Elev.... | 144⅜* | 143¾ | 500 |
| Am. Loc..... | 68¼ | 65 | 19,100 | Met. St. Ry... | 24* | 24* | ——— |
| Am. Loc., pfd. | 120½ | 120* | 600 | N.Y. & N.J.Tel | 142½* | 141 | 100 |
| Am. Tel. & Cbl. | 76* | 76* | ——— | Steel, com..... | 77½ | 76¾ | 794,140 |
| Am. T. & T... | 142½ | 141½ | 18,845 | Steel, pfd..... | 126¾ | 125⅛ | 25,937 |
| B. R. T..... | 80½ | 79 | 31,080 | W. U. T..... | 75½ | 74 | 3,125 |
| Gen. Elec..... | 171¾ | 169 | 5,748 | West'h, com... | 88¾ | 86 | 12,680 |
| Int.-Met., com. | 15½ | 14¼ | 10,100 | West'h, pfd.... | 124½* | 130* | 122 |

PHILADELPHIA.

| | Aug. 9. | Aug. 16. | Shares sold. | | Aug. 9. | Aug. 16. | Shares sold. |
|---|---|---|---|---|---|---|---|
| Am. Rys..... | 45⅞ | 45⅞* | ——— | Phila. Elec.... | 12⅝ | 12¼ | ——— |
| Elec. Co. of A.. | 12⅜ | 12⅛ | ——— | Phila. R. T... | 31¼ | 30⅜ | ——— |
| Elec. St. B'ty.. | 62 | 61¾ | ——— | Phila. Trac... | 91 | 91 | ——— |
| E. S. B'ty,pfd. | 49* | 49* | ——— | Union Trac... | 55¼ | 54½ | ——— |

CHICAGO.

| | Aug. 9. | Aug. 16. | Shares sold. | | Aug. 9. | Aug. 16. | Shares sold. |
|---|---|---|---|---|---|---|---|
| Chi. City Ry.. | 180* | 180* | ——— | Chi. Tel. Co.. | 134 | 135½* | ——— |
| Chi. Rs.,Ser.1. | 119½* | 119½* | ——— | Met. El., com.. | 16* | 17¾* | ——— |
| Chi. Rs.,Ser.2. | 37⅞* | 37 | ——— | Met. El., pfd.. | 49 | 49* | ——— |
| Com. Edison.. | 120 | 121* | ——— | Nat'l Carbon... | 94* | 98 | ——— |
| Chi. Sub'ws... | 23½ | 20½* | ——— | Nat'l C., pfd... | 119* | 119* | ——— |

BOSTON.

| | Aug. 9. | Aug. 16. | Shares sold. | | Aug. 9. | Aug. 16. | Shares sold. |
|---|---|---|---|---|---|---|---|
| Am. T. & T... | 142¾ | 141⅝ | ——— | Mex. Tel..... | 2¾* | 2½* | ——— |
| Cum. Tel..... | 145* | 142½* | ——— | Mex. Tel., pfd. | 6¼* | 5¾ | ——— |
| Edison E. Ill... | 254 | 252 | ——— | N. E. Tel.... | 137¾ | 137 | ——— |
| Gen. Elec..... | 172 | 169 | ——— | W. T. & T.... | 11¼ | 11⅜ | ——— |
| Mass. E. Ry.. | 13 | 14⅛ | ——— | W. T. & T., p. | 89 | 81 | ——— |
| Mass E. R., p. | 74⅜ | 75 | ——— | | | | |

*Last price quoted.
Shares sold are for week Aug. 9 to Aug. 14.

EMPIRE DISTRICT ELECTRIC COMPANY.—The name of the new holding company, organized by the H. L. Doherty & Company interests in the neighborhood of Joplin, Mo., is to be the Empire District Electric Company. As already detailed in these columns, the Doherty interests control the Consolidated Light, Power & Ice Company, the Missouri Zinc Fields Company and the Spring River Power Company. The new company will come into possession and control of these three properties. It is proposed to furnish electric energy, from hydro-electric and steam plants, to the entire Joplin district. This comprises a radius of about 30 miles from Joplin and covers an extremely busy mining district. The new company has been organized with an authorized bond issue of $6,000,000, 5 per cent bonds, and with authorized issues of $3,000,000 preferred and $3,000,000 common stock. It is proposed to offer for sale at once $1,250,000 of these bonds, giving as bonuses to the purchaser $500,000 preferred and $1,600,000 common stock. Full details of this offer will be made public within the next 10 days.

DENVER GAS & ELECTRIC BONDS.—The Denver Gas & Electric Company has sent out notices that it will redeem the entire outstanding balance of the 6 per cent, 5-15 year gold mortgage bonds. These bonds were dated April 1, 1903, and amount to $458,000. The bonds, with interest, will be paid upon presentation at the office of the Bankers' Trust Company, 7 Wall Street, on and after Oct. 1. The redemption of these bonds has nothing to do with the refinancing plans of the company now being matured by H. L. Doherty & Company, further than to clear the decks for action. This plan, which was outlined in the issue of June 3, 1909, contemplates the authorization of a $25,000,000 bond issue, to be placed upon the market as needed. The money for the retirement of the bonds which are now called will not come from this issue but will be drawn entirely from surplus earnings. The reports of the company's earnings are still most flattering.

GEORGIA TRACTION MERGER.—The recent passage by the Legislature of Georgia of the Boyd bill permitting the consolidation of the Atlanta-Macon interurban line, the Macon-Albany interurban line, and the Central Georgia Power Company, means the formation of a $10,000,000 merger of the three concerns named with the Macon electric systems, the source of power being the Central Georgia Power Company. President Jordan W. Massee has announced that he has secured the cooperation of a New York firm to underwrite the bond issue and that the building of the interurban line will be undertaken within a short time. The total cost of this line will be between $2,500,000 and $3,000,000.

NATIONAL MINING & POWER COMPANY.—A new company has recently been organized at Birmingham, Ala., with a capitalization of $2,500,000, called the National Mining & Power Company, which is designed to furnish energy throughout the Alabama mining section. C. F. Wheelock, of Birmingham, is the president of the new company; W. K. Wheelock, vice-president, and M. H. Bone, secretary and treasurer. The company's charter gives it the right to develop, build and operate plans for the production of power, including gas, water, light and sewerage, and the developing of mineral lands, dams, power plants, factories, equipments, etc.

NEW ORLEANS RAILWAY BONDS IN FRANCE.—The New Orleans Railway & Light Company has placed $2,580,000 of its 40-year 5 per cent bonds with the French Finance Corporation. These bonds were placed through Bertron, Griscom & Jenks, of New York. The new mortgage upon which the bonds are secured authorizes an issue of $50,000,000. Of these $30,000,000 will be reserved to retire the company's outstanding bonds. The new money obtained is to be expended in extensions and improvements.

HOLDING COMPANY FOR SAN FRANCISCO PROPERTIES.—The Railroads & Power Development Company has recently been incorporated under the laws of Maine as a holding corporation for the Stanislaus Power Development Company and the San Francisco Electric Railways, the new company which is to acquire and operate the tractions in San Francisco. All of the capital stock of the Railroads & Power Development Company will be held by the United Railways Investment Company.

KEYSTONE TELEPHONE COMPANY.—The annual report of the Keystone Telephone Company, of Philadelphia, which has just been issued, shows that the company has increased the number of its telephones in service in the city and suburbs from 17,000 in 1905 to 30,000 in 1908. The company has 335 miles of ducts in the streets. The total net earnings of the company for the year were $130,145. This was after paying all fixed charges and allowing $100,000 for renewals.

HICKORY (N. C.) HYDRO-ELECTRIC PLANT.—After some delay in perfecting details, it is now announced that all of the capital stock has been taken in the hydro-electric water-power development on the Catawba River, near Hickory, N. C., in which Col. M. E. Thornton is a principal promoter. It is said that a large cotton mill will be erected and will use power from the proposed plant.

ROCKINGHAM (N. C.) POWER COMPANY'S SALE.—Judge Pritchard of the United States Court in North Carolina has made an order setting Aug. 23 as the date for hearing any protests from creditors against the sale of the Rockingham Power. Company's property to the reorganization committee for $1,000,000. An order authorizing $17,500 receiver's certificates was also entered.

WESTINGHOUSE DEFERRED DIVIDENDS.—In spite of the fact that the business of the Westinghouse Electric & Manufacturing Company has been extraordinarily good for the past few months, it is announced by officers of the company that no steps have been taken toward paying the accumulated back dividends on the 7 per cent cumulative preferred stock. The dividends on the outstanding $3,998,700 preferred now amount to 12½ per cent, or, in round figures, $500,000. The finances of the company are at present in satisfactory shape, but it is not deemed wise, until after a longer period of successful operation, to make so large a draft upon the existing cash resources.

BROOKLYN RAPID TRANSIT EARNINGS.—There is practically no doubt that as soon as the directors of the Brooklyn Rapid Transit can be gotten together for a meeting they will declare another quarterly dividend of 1 per cent. The earnings of the company, while they have been fair, have not been so heavy as to inspire any hope for an increase in the dividend. Although the figures have not yet been given out, it is understood that the earnings will amount to about 4½ per cent on the capital stock. Within the past year large sums spent upon improvements have been charged into the expense account, thus making the percentage of operation cost appear very high.

PACIFIC GAS & ELECTRIC BONDS.—Offering is being made in New York by N. W. Halsey & Company of the unsold balance of the $2,340,000 issue of Pacific Gas & Electric Company's bonds recently purchased by that firm. These bonds bear 6 per cent and are offered at par. The properties of the company embrace 154,000 developed electric horse-power, distributed through 2525 miles of transmission lines, including 167 miles of underground cable in San Francisco. There is also 100,000 undeveloped horse-power in reserve. In addition to these properties the company has 16 gas plants with 1400 miles of mains and 132,000 meters.

ALBANY & HUDSON REFINANCING NOT OPPOSED.—At the hearing before the Public Service Commission of the Second District on the proposed plan for refinancing the Albany & Hudson Railroad Company, the promised opposition of the present bondholders did not materialize. It was announced at the meeting that the new cash that will be raised by the issue of $1,500,000 5 per cent bonds would be used for the purchase of the Albany & Greenbush Bridge over the Hudson River, between Albany and Rensselaer, and for double tracking the line between the latter place and Electric Park.

AMERICAN TELEPHONE STOCK LISTED IN CHICAGO.—The listing committee of the Chicago Stock Exchange has approved the application of the American Telephone & Telegraph Company to list $239,880,700 of capital stock and $150,000,000 of convertible bonds. The Illinois Trust Company has been named as the Chicago transfer agent and the Northern Trust Company as the registrar.

CLEVELAND ELECTRIC BONDS.—The stockholders of the Cleveland Electric Illuminating Company have just authorized a bond issue of $30,000,000 for future improvements and acquisitions. The details of this refinancing plan have not as yet been given out. It is reported in Cleveland that this large bond issue is the initial step in a plan for merging all of that city's public utilities.

## REPORTS OF EARNINGS.

| | Gross Earnings. | Expenses. | Net Earnings. | Charges. | Surplus. |
|---|---|---|---|---|---|
| **American Light & Traction Company:** | | | | | |
| Six months ended June, 1909 | $1,546,980 | $53,787 | $1,493,192 | $1,175,332 | $317,860 |
| Six months ended June, 1908 | 1,217,426 | 24,000 | 1,183,426 | 989,996 | 203,430 |
| **Associated Bell Operation Companies:** | | | | | |
| June, 1909 | 11,303,309 | 4,681,672 | 6,621,637 | 7,172,934 | 2,448,703 |
| June, 1908 | 10,464,506 | 4,942,100 | 5,972,406 | 3,690,890 | 2,281,516 |
| **Chautauqua Traction Company:** | | | | | |
| Quarter ended June 30, 1909 | 22,361 | 17,652 | 4,708 | 14,404 | 10,198 |
| Quarter ended June 30, 1908 | 16,248 | 15,655 | 593 | 12,970 | 12,769 |
| **Consolidated Gas, Electric Light & Power Company, Baltimore:** | | | | | |
| Year ended June 30, 1909 | ..... | ..... | 1,228,974 | 442,440 | 786,534 |
| Year ended June 30, 1908 | ..... | ..... | 1,060,949 | 442,440 | 618,509 |
| **Dallas Electric Corporation:** | | | | | |
| May, 1909 | 103,525 | 66,182 | 37,342 | 25,506 | 11,836 |
| May, 1908 | 90,459 | 64,063 | 26,396 | 26,606 | *209 |
| **Elmira (N. Y.) Water, Light & Railroad Company:** | | | | | |
| Quarter ended June 30, 1909 | 61,883 | 42,467 | 19,416 | ..... | ..... |
| Quarter ended June 30, 1908 | 61,031 | 42,222 | 18,809 | ..... | ..... |
| **El Paso Electric Company:** | | | | | |
| May, 1909 | 47,509 | 28,681 | 18,828 | 7,899 | 10,928 |
| May, 1908 | 42,633 | 28,479 | 14,154 | 7,247 | 6,906 |
| **Fairmont & Clarksburg (W. Va.) Traction Company:** | | | | | |
| June, 1909 | 38,131 | 12,946 | 25,185 | ..... | 27,283 |
| June, 1908 | 33,459 | 11,698 | 21,762 | ..... | 23,551 |
| **Galveston-Houston Electric Company:** | | | | | |
| May, 1909 | 103,603 | 58,731 | 44,872 | 18,670 | 26,201 |
| May, 1908 | 91,023 | 54,700 | 36,322 | 17,131 | 19,191 |
| **Hornellsville (N. Y.) Electric Railway Company:** | | | | | |
| Quarter ended June 30, 1909 | 5,012 | 3,073 | 1,939 | 700 | *1,239 |
| Quarter ended June 30, 1908 | 5,417 | 6,318 | *900 | 700 | *1,600 |
| **Kingston (N. Y.) Consolidated Railroad Company:** | | | | | |
| Quarter ended June 30, 1909 | 38,847 | 21,693 | 17,154 | 12,756 | 3,313 |
| Quarter ended June 30, 1908 | 38,745 | 22,152 | 16,592 | 9,566 | 5,535 |
| **Keystone Telephone Company:** | | | | | |
| Year ended June 30, 1909 | 1,073,462 | 531,009 | 542,453 | 412,308 | 130,145 |
| Year ended June 30, 1908 | 1,051,071 | 539,123 | 511,948 | 413,112 | 98,836 |
| **Lake Superior Corporation:** | | | | | |
| Year ended June 30, 1909 | 566,511 | 543,516 | ..... | ..... | 22,995 |
| Year ended June 30, 1908 | 566,616 | 538,747 | ..... | ..... | 27,869 |
| **Lexington & Interurban Railways Company:** | | | | | |
| June, 1909 | 51,373 | 38,186 | 13,186 | ..... | ..... |
| June, 1908 | 54,142 | 34,518 | 19,624 | ..... | ..... |
| **Minneapolis General Electric Company:** | | | | | |
| May, 1909 | 84,673 | 37,339 | 47,333 | 29,670 | 17,663 |
| May, 1908 | 73,677 | 36,662 | 37,015 | 31,221 | 5,793 |
| **Northern Texas Electric Company:** | | | | | |
| May, 1909 | 104,899 | 57,946 | 46,952 | 17,189 | 29,763 |
| May, 1908 | 83,807 | 54,856 | 28,951 | 16,553 | 12,398 |
| **Oneida Railway Company:** | | | | | |
| Quarter ended June 30, 1909 | 88,980 | 51,455 | 37,524 | 4,642 | 29,807 |
| Quarter ended June 30, 1908 | 73,026 | 42,198 | 30,827 | 5,472 | 23,480 |
| **Savannah Electric Company:** | | | | | |
| May, 1909 | 50,274 | 32,624 | 17,650 | 15,707 | 1,942 |
| May, 1908 | 48,097 | 30,243 | 17,853 | 15,336 | 2,517 |
| **Schenectady Railway Company:** | | | | | |
| Quarter ended June 30, 1909 | 240,925 | 144,735 | 96,189 | 22,500 | 64,542 |
| Quarter ended June 30, 1908 | 220,110 | 158,559 | 61,551 | 23,179 | 31,584 |
| **Seattle Electric Company:** | | | | | |
| May, 1909 | 457,258 | 274,459 | 182,799 | 91,803 | 90,995 |
| May, 1908 | 386,961 | 216,857 | 170,103 | 80,087 | 90,016 |
| **Tampa Electric Company:** | | | | | |
| May, 1909 | 47,820 | 27,162 | 20,658 | 4,008 | 16,649 |
| May, 1908 | 45,405 | 32,254 | 13,150 | 2,303 | 10,847 |
| **Utica & Mohawk Valley Railway Company:** | | | | | |
| Quarter ended June 30, 1909 | 309,839 | 191,314 | 117,525 | 56,194 | 43,839 |
| Quarter ended June 30, 1908 | 272,979 | 155,602 | 117,376 | 42,052 | 68,462 |
| **Virginia Railway & Power Company:** | | | | | |
| June, 1909 | 179,625 | 109,206 | 70,419 | ..... | ..... |
| June, 1908 | 174,858 | 125,151 | 49,707 | ..... | ..... |

*Deficit.

# GENERAL NEWS

## Construction News.

SELMA, ALA.—The City Council has granted the Selma Street & Suburban Railway Company a franchise to extend its railway on Water Street.

SPEIGNER, ALA.—Work has commenced by the State Convict Bureau on the construction of a dam in connection with a proposed power plant. Edgar B. Kay, of Tuscaloosa, Ala., is engineer in charge of the work; J. Craig Smith is president of the bureau.

TUCSON, ARIZ.—The Sonora Copper Company is planning to install an electric power plant, an aerial tramway and a 100-ton matting furnace in the Caracahui Mountains, about three miles from the Sonora Railroad. A. N. Conrad will have charge of the work.

BENTON, ARK.—The Atkinson Water Power Company, recently organized, proposes to operate a water power plant on Saline River. The officers of the company are: J. F. Lee, president, and J. R. Gibbons, secretary and treasurer.

MURFREESBORO, ARK.—Plans are being prepared by the Pike County Water Power Company, of Little Rock, Ark., to construct a hydro-electric plant on the Little Missouri River, near Murfreesboro. It is proposed to develop 10,000 hp. at a cost of $500,000. The Fuller-Coult Company, of St. Louis, Mo., will have charge of the engineering work.

PRAIRIE GROVE, ARK.—The capital stock of the Prairie Grove Telephone Company has been increased from $6,000 to $12,000.

FOREST HILL, CAL.—It is reported that John A. Britton, general manager of the Pacific Gas & Electric Company, is interested in a project to install a large electric power plant on the Middle Fork of the American River, near Horse Shoe Bar, about three miles from Forest Hill, work on which has already commenced. It is understood that about 750 hp will be developed. The plant, it is said, will furnish electricity for the Cash Rock mine, located two or three miles from Horse Shoe Bar. It is expected that ultimately the plant will be connected with other transmission lines of the company and will furnish electrical energy in Sacramento.

GLENDALE, CAL.—Bids will be received by C. B. Woodbury, city clerk, for the purchase of $40,000 in bonds, the proceeds to be used for establishing a municipal electric light plant.

LONG BEACH, CAL.—The Harbor Electric Light & Power Company, recently incorporated, has secured a site for its proposed power plant, near Daisy Avenue School.

VISALIA, CAL.—The Visalia Electric Railroad Company has completed the grading of the extension of its railroad from Lemon Cove to Woodlake, a distance of 12 miles. It is said that the company is planning for another extension from Exeter to Lindsay and Portersville.

ANTONITO, COL.—The directors of the Conejos Co-operative Mills Manufacturing Company have voted to build a mill at Antonito, replacing the Conejos mill, which was recently burned. The hydro plant at Conejos will be retained and the power will be transmitted electrically to Antonito to furnish the electrical power for the new mill and for lighting the town of Antonito, with which the company has contracted to furnish electricity for lamps.

DENVER, COL.—It is reported that plans have been completed for financing the Colorado Interurban Electric Railroad Company, and that work on construction of the proposed electric railway to connect Denver, Brighton, Fort Lupton, Greeley and other towns in the northern coal district will commence in the near future. C. H. Pierce is general counsel for the company.

GEORGETOWN, COL.—The construction of a power plant on Clear Creek, three miles below Georgetown, is contemplated, investigations for which are being made by W. H. Goodrich, electrical engineer, of Mineral Wells, Tex. It is said that 600 hp can be developed at a small cost. The Golden Glory Tunnel Mining Company, which is backing the project, will utilize 100 hp and the remainder will be sold to adjoining mines.

GREELEY, COL.—It is reported that the Greeley-Pouche Irrigation Company will soon award contracts for the construction of a power plant and irrigation system in northern Colorado, including the building of the Roosevelt reservoir, which is to be enlarged by the construction of a dam 400 ft. high. Lines will be erected to transmit electricity to Denver, which will be used to operate the tramway and interurban railways out of Denver. D. A. Canfield, of Greeley, and J. A. Beeler, president of the Denver Tramway Company, of Denver, are interested in the project.

MONTROSE, COL.—The Colorado Telephone Company is planning extetnsive improvements to its service throughout the State which will involve an expenditure of about $60,000, and will include the construction of a 20-mile line to the Escalante section in Delta County; a 12-mile extension, from Montrose to Bostwick Park, and a 3-mile extension from Olathe to an agricultural community to the northeast. Improvements will be made to the Delta system, which will involve an expenditure of about $8,000.

KILLINGLY, CONN.—The Killingly Power Company, recently incorporated, has acquired four water privileges in East Killingly. It is said that the company proposes to supply electricity for some of the electric railways in the eastern part of Connecticut.

WASHINGTON, D. C.—The electric lighting plant for furnishing electricity for lighting the book shelves, etc., for the Library of Congress will be erected by day labor, the electricians to be employed by Bernard R. Green, superintendent of the building. The cost of the equipment of the plant is estimated at $13,000, bids for which were opened Aug. 11.

TAMPA, FLA.—The Tampa-Sulphur Springs Traction Company, it is reported, is planning to extend its railway along Eighth Avenue to Thirty-sixth Street and on Fifth Avenue to Thirty-second Street. L. Brill is general manager.

ATLANTA, GA.—It is stated that the Central Georgia Power Company, which is erecting a 20,000 hp. power plant on the Ocmulgee River, near Jackson, will make its headquarters in Atlanta, Ga. The company will erect a large transforming station in this city. W. J. Massee is president of the company.

CUTHBERT, GA.—We are informed that an election will be held in October to vote on the proposition to issue bonds for improvements to the electric light plant, water-works and sewerage systems. J. B. McCrary, of Atlanta, Ga., is engineer.

DOUGLASVILLE, GA.—The city has issued $10,000 in bonds for improvements to the municipal electric light plant.

DUBLIN, GA.—P. L. Wade, S. M. Kellam, W. W. Robinson and associates have applied to the City Council for a franchise to construct and operate an electric railway over certain streets in Dublin.

SAVANNAH, GA.—The Twin City Power Company, holding a franchise to build a dam and construct an electric plant on the Savannah River at Augusta, has applied to the City Council for a franchise to sell power in Savannah. It is expected that similar franchises will be asked of other cities and towns in the State of Georgia.

WAYCROSS, GA.—The Waycross Electric Light & Power Company has submitted a proposition to the City Council, offering to dispose of its entire plant and holdings for the sum of $40,000. The company claims that the plant has been valued by an expert at approximately $60,000. The company, in lieu of the above, also offers to continue furnishing electricity to the town at a reduction of from 15 cents per kw-hour to 12 cents per kw-hour, with a special rate of 10 cents to large consumers of electricity for lighting purposes, etc. The company also offers to furnish street arc lamps at $60 instead of $75 per year, the present rate. The matter is still under consideration on the part of the town.

WHITESTONE, GA.—Several hydro-electric projects in this vicinity are being investigated by H. von Schon, consulting engineer, of Detroit, Mich., in the interests of the marble industries.

CALDWELL, IDAHO.—Plans are being considered for watering the proposed Gem Irrigation District. They involve the installation of a pumping plant on the Snake River in connection with the transmission of electricity from the Thousands Springs, a distance of 120 miles, to irrigate 32,000 acres. The cost of the transmission lines is estimated at $240,000.

MOUNTAIN HOME, IDAHO.—It is reported that the Slick Brothers' Construction Company is making preparations to commence work on the construction of a large power plant for the Crane Falls Power & Irrigation Company at Crane Falls. The company proposes to furnish electricity for pumping water for irrigation purposes and to various towns in this vicinity for lamps and motors.

HAGERMAN, IDAHO.—Plans are being prepared by H. A. Stroud and associates, of Hagerman, for the installation of a 75,000-hp electric plant and construction of an electric railway.

SANDPOINT, IDAHO.—The Northern Idaho & Montana Power Company has commenced work on the construction of its transmission line from Sandpoint, Idaho, which, when completed, will furnish electricity to Newport and intervening towns. Work will soon commence on the substation in Newport, which will cost about $20,000. Equipment for the building has already been ordered. The company has recently purchased the power and water plants at Kalispell, where it is planning extensive improvements.

BARRINGTON, ILL.—Negotiations are under way for the sale of the plant and holdings of the Barrington Electric Lighting Company. The system is to be purchased by a company which proposes to furnish electricity to all small towns between Barrington and Chicago. A. L. Robertson is manager of the Barrington Electric Lighting Company.

BENTON, ILL.—A proposition has been submitted to the City Council by F. O. Hamilton, of this city, and C. E. Hamilton, of Carbondale, Ill., proposing to take over the municipal electric light plant and building a new plant to supply the city with electricity for lamps and motors, and also water. The City Council has appointed a special committee, con-

sisting of two members of the Council and F. H. Stamper and W. W. McCreery, to make investigations of plants in other cities and if possible to come to an agreement with the parties in regard to the installation of the plant, and report its decision at the next meeting of the Council.

CHICAGO, ILL.—By the use of electricity generated by the drainage canal instead of by steam power the city has saved $72,542 in the street lighting system during the last year, and it is expected that more than $100,000 will be saved this year. In the annual report, published by William Carroll, city electrician, a saving in operating expenses of $3.69 and in water of $4.73 is shown on each of the 8602 lamps used by the city, and an increase of $3.31 per lamp in investment charges. Six plants and substations operated by energy purchased from the Sanitary District were operated during the first half of 1908, and since that time two new stations have been built. With all of the plants operating during 1909 a still greater reduction is expected in the cost of lighting the city. The net cost per lamp in the last ten years has varied from $60.98 to $52.93 in 1907. In 1908 the cost was reduced to $45.86 per lamp.

CHRISMAN, ILL.—The City Council has granted the Paris & Northern Railway Company, of Danville, Ill., a 50-year franchise to operate its electric railway in Chrisman. The railway will extend from Ridgefarm to Paris, a distance of 26 miles.

GENESEO, ILL.—The capital stock of the Geneseo Telephone Company has been increased from $2,500 to $10,000.

GLEN ELLYN, ILL.—The municipal electric light plant has been purchased by Carl S. Spaulding, with a 20-year franchise, who will make extensive improvements to the plant, including the installation of a 100-hp. Foos suction gas engine and a Smith gas producer to be installed within 30 days.

LA SALLE, ILL.—Plans are being prepared by the Citizens' Lighting Company for improvements and extensions to its plant, which will involve an expenditure of about $42,000, and will include the installation of a 300-kw steam turbine with pumps and condensers, a 200-kw, alternating-current generator and other equipment required for changing the lighting system from direct to alternating current.

MONMOUTH, ILL.—The residents of Aledo have raised a bonus of $10,000, to be given to the Rock Island Southern Railroad in consideration of building a branch road into Mercer County.

MONMOUTH, ILL.—The Monmouth Telephone Company is making arrangements to make extensions to its plant, which will involve an expenditure of about $20,000.

MOUNT MORRIS, ILL.—The electric plant of the Mt. Morris Electric Light & Power Company has been taken over by Kable Brothers Company, publishers. The company is installing a new plant, which will furnish electricity to operate its printing office and for lighting the town. A day service will be established about Nov. 1, 1909. H. J. Kable is secretary and treasurer, and C. H. Thomas, manager.

INDIANAPOLIS, IND.—Both the Central Union Telephone Company and the Indianapolis Telephone Company are erecting new branch exchange buildings at Irvington. The cost of each will be about $12,000.

NEW ALBANY, IND.—The Council has adopted a resolution authorizing the Board of Public Works to advertise for bids for lighting the streets of the city for a term of 10 years, beginning with Sept. 1, 1909.

NEW CARLISLE, IND.—Negotiations have been closed whereby the South Shore & South Bend Railway Company will supply the town of New Carlisle with electrical energy for a term of 25 years. The town has been operating a municipal electric plant, a direct-current, 220-volt system, in connection with the water-works plant. The company will supply alternating current, single phase, 25 cycles, 110-220 volts. It is expected that series tungsten street lamps will be installed. The citizens are anxious to have a day service established.

NOBLESVILLE, IND.—The Noblesville Heat, Light & Power Company has recently placed orders for additional equipment for its power house, which include a 300-kw, Allis-Chalmers turbine, two 200-hp Sterling boilers and auxiliaries. F. T. Holliday, of Indianapolis, Ind., is secretary and treasurer.

ALGONA, IA.—The Western Electric Company is reported to have purchased the controlling interest in the Algona Telephone Company. It is understood that extensive repairs and improvements will be made to the system.

CEDAR RAPIDS, IA.—Contracts have been awarded by the Cedar Rapids & Iowa City Railway & Light Company for improvements to its power house in Cedar Rapids, aggregating $125,000. The output of the plant will be increased to 8000 kw. H. M. Byllesby & Company, of Chicago, Ill., are consulting engineers.

GRINNELL, IA.—The City Council has accepted the proposition of the Grinnell Electric Light & Heating Company to replace the present street arc lamps for tungsten lamps. It is proposed to install 180 tungsten lamps of 80 cp., which will greatly improve the street lighting system without additional cost to the city.

MARSHALLTOWN, IA.—The Mason City & Clear Lake Railway Company is reported to have placed orders for equipment for a new power plant, which includes a 2000-hp turbine engine and a 500-hp motor generator set for a substation at Clear Lake. When the new plant is completed the old power plant at Emery will be abandoned.

MARSHALLTOWN, IA.—H. W. Darling, of Chicago, Ill., is reported to have applied to the City Council for a franchise to install an electric light plant and street railway system.

WATERLOO, IA.—Extensive improvements and extensions are planned by the Waterloo, Cedar Falls & Northern Railway Company which will involve an expenditure of about $500,000 and include an extension from Denver Junction to Waverly, a distance of six miles, the reconstruction and double tracking of its lines between Waterloo and Cedar Falls, the erection of a car house and shops and increasing the output of the power station. C. D. Coss, of Waterloo, is general manager.

COUNCIL GROVE, KAN.—The City Council has granted H. H. Sparks, of Junction City, Kan., a franchise to construct and operate an electric light and pawer plant in Council Grove.

LUCAS, KAN.—The installation of an electric light plant and water works system are under consideration, plans for which are being prepared by the J. S. Worley Company, engineers, of Kansas City, Mo. The cost of the proposed plant is estimated at $30,000.

ST. JOHNS, KAN.—Bids will be received about September 15 by Burns & McDonnell, Scarritt Building, Kansas City, Mo., for the construction of an electric light plant, water works and sewer systems, for which $40,000 in bonds have been voted.

WICHITA, KAN.—The Arkansas Valley Interurban Railway Company is reported to have completed preliminary surveys for its proposed electric railway from Wichita to Hutchinson, a distance of 50 miles. J. D. Hodgson is constructing engineer.

NEW IBERIA, LA.—The Board of Commissioners of Electric Lights and Water Works has petitioned the City Council for permission to issue $45,000 in bonds, the proceeds to be used to secure the services of a consulting engineer, installation of complete new equipment for electric lighting plant and pumping station for water works, renovating of electric transmission lines, providing meters for entire new system and for extension of both water and lighting systems.

NEW ORLEANS, LA.—Bids will be received until September 7, at the office of the supervising architect, Washington, D. C., for mechanical equipment (excepting elevators), including plumbing, gas fitting, boiler plant, heating and ventilating system, electric generating system, vacuum cleaning system and clock system, for the U. S. post office and court house building at New Orleans, La., in accordance with the drawings and specifications, copies of which may be obtained at the above office, or at the office of Hale & Rogers, architects, 11 East Twenty-fourth street, New York, N. Y. James Knox Taylor is supervising architect.

SPRINGFIELD, LA.—A telephone company is being organized in this place to construct a telephone line to Hammond, via Brakenridge's Mill and Albany, which will probably be extended to Centerville, Clio and the French Settlement.

BELFAST, MAINE.—Permission has been granted to the Penobscot Bay Electric Company to erect its transmission lines from Searsport over the back road to Swan Lake Avenue, thence to Belfast. The company is planning to furnish electricity to operate the works of Coe-Mortimer Company by Nov. 1.

PORTLAND, MAINE.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until August 27, for installing a vacuum cleaning system in the U. S. post court house at Portland, Maine, in accordance with drawings and specifications, copies of which may be secured at the above office, or at the office of the custodian, Portland, Maine. James Knox Taylor is supervising architect.

HAGERSTOWN, MD.—The Hagerstown Railway Company contemplates the purchase of a 1000-hp condenser for its power plant at Hagerstown immediately. H. C. Alvey is chief engineer.

UNION BRIDGE, MD.—The Tidewater Portland Cement Company, 115 Broadway, New York, N. Y., has awarded the contract for designing and erecting its new 3000-bbl. cement plant in Union Bridge to the Fuller Engineering Company, of Allentown, Pa. The plant will be operated by electricity throughout. Contracts for machinery will soon be let, specifications for which will be made by the Fuller Engineering Company, which will also receive bids for the equipment, but the purchases will be made by the Tidewater Portland Cement Company. John K. Tener, of Charleroi, Pa., is president of the company and Joseph T. Fanning, of New York, N. Y., vice-president.

ATTLEBORO, MASS.—Work has commenced on the construction of the new plant to be erected by Frank Mossberg Company, of Attleboro, at a cost of $50,000. Power for operating the plant will be furnished by a steam or gas engine direct connected to a generator. Many of the larger machines will be operated by independent motors.

BELCHERTOWN, MASS.—The citizens are considering the question of establishing an electric lighting system in the town. A special town meeting will soon be called to take action on the matter.

WAREHAM, MASS.—The Buzzards Bay Lighting Company has been awarded the contract for installing electric lamps in the Town of Wareham. The company is planning to furnish electricity in all the towns from Wareham to Falmouth. Eugene Carpenter is interested in the company.

WESTFIELD, MASS.—The Western Massachusetts Street Railway Company has applied to the Board of Selectmen for a franchise to extend its railway in Westfield.

WESTFIELD, MASS.—The contract for extensions to the municipal electric power plant has been awarded to the Westinghouse Electric & Manufacturing Company, for $24,322. The output of the plant will be increased by 900 hp and the equipment will include a 750-kw, horizontal

turbine engine, generator, switchboard, meters and Terrill regulators. George Pettibone is manager of the municipal electric plant.

WILLIMANSETT, MASS.—The citizens are contemplating the installation of an electric lighting system, the service to be furnished from the municipal electric light plant at Chicopee, Mass.

WORCESTER, MASS.—A permit has been granted to the Connecticut River Transmission Company to erect a transformer station in Greendale, to cost $10,000. J. G. White & Company, of New York, N. Y., are engineers and Fred T. Ley & Company, contractors.

BEMIDJI, MINN.—The Warfield Electric Company has applied to the City Council for a renewal of its franchise in this city, which will soon expire.

LAKE CITY, MINN.—Plans are being considered for the installation of a 100-kw turbine this year. E. V. Lombard is superintendent.

ROCHESTER, MINN.—The Zumbro Power Company, it is stated, proposes to erect a power plant at Zumbro Fall, 14 miles north of Rochester, to supply electricity for lamps and motors.

BILOXI, MISS.—Plans are being made by the Cumberland Telephone Company for rebuilding the local telephone system, at a cost of about $22,000.

JOPLIN, MO.—It is reported that plans have been perfected by Henry L. Doherty & Co., New York, N. Y., for the construction of a large power plant, the site for which has not yet been definitely announced. The initial installation will cost about $2,000,000, and will have an output of 15,000 hp, with provisions to increase it to 60,000 hp at a cost of $6,000,000. The transmission lines will be extended throughout the entire lead and zinc belt. Work will soon commence on surveying the route for extensions to Carthage, Alba, Neck City, Spring City, Baxter Springs, Granby, Neosho and other towns. It is understood that all transmission lines in Joplin, Webb City and Galena will be rebuilt.

ST. JOSEPH, MO.—The Home Telephone Company has awarded contract for the construction of an exchange building on Tenth Street, to the Selden-Breck Construction Company. The cost of the building is estimated at $80,000. The company has taken over the system of the Andrew County Mutual Telephone Company under a lease for a term of 43 years. The Home Telephone Company will begin work at once on the erection of copper circuits to connect with the lines of Andrews County company.

ST. LOUIS, MO.—Arrangements are being made by the Courtney Shoe Company for enlarging its power plant with a view of supplying electricity for lamps and motors for the entire plant. Proposals will be received by William H. Bryan, 315 Lincoln Trust Building, St. Louis, Mo., consulting engineer for the company, for one 200 hp. high-speed Corliss engine; one 125 kw., three-wire, direct-current generator, and twelve 230-volt motors of various sizes.

STEVENSVILLE, MONT.—It is reported that the Bitter Root Irrigation Company, of Bitter Root, will install an electric light system.

BEATRICE, NEB.—The New Home Telephone Company is planning to extend its rural telephone lines to all parts of Gage County from the Beatrice exchange, and also proposes to establish a direct copper circuit with Barneston, Pawnee City, Liberty, Tecumseh and Fairbury. The cost of the work is estimated at about $25,000.

CRAB ORCHARD, NEB.—The plant and holdings of the Crab Orchard Telephone Company have been purchased by the Nebraska Telephone Company. The price paid for the system is said to have been $19,500.

EDGAR, NEB.—At a special election held Aug. 5 the citizens voted to issue $5,000 in bonds to purchase an electric light plant. The town holds an option of $4,000 on the plant of the Edgar Light & Power Company, which will be paid from the bonds voted, and the remainder will be used to install new equipment in the plant.

FAIRBURY, NEB.—Plans are being made by the Fairbury Telephone Company to improve its service, which will include the erection of three copper metallic circuits to Beatrice, at a cost of $10,000. This will give Fairbury direct communication with St. Joseph, Kansas City and St. Louis.

HASTINGS, NEB.—Preparations are being made for increasing the output of the municipal electric light plant and water works, which will include the installation of a generator direct connected to turbine and condenser. It is stated that bids have been received by the Council for the above equipment.

O'NEIL, NEB.—The citizens are contemplating the installation of an electric lighting system in O'Neil. It is expected to have the plant in operation before the coming winter.

STANTON, NEB.—Plans are being considered for extensions to the municipal electric light plant, which will include the installation of a 75-kw. generator, 50 tungsten street lamps and the erection of three miles of transmission lines. Benjamin Henning is manager.

BERLIN, N. H.—The power house of the Cascade Electric Light & Power Company was destroyed by fire Aug. 8, causing a loss of about $100,000. The company furnished electricity for lighting the streets and for the street railway. Electrical service for the street lamps will be furnished by the generator located in the Burgee mill, but the street railway will be out of commission until arrangements can be made to secure power from the Berlin Electric Company.

MANCHESTER, N. H.—The Manchester & Derry Electric Company has filed an amendment to its charter increasing its capital stock from $200,000 to $240,000.

MILTON, N. H.—Work has been commenced by the Great Falls Manufacturing Company on the development of its water privileges at Milton, N. H., for the purpose of furnishing power for an electric light plant in Milton. It is expected to have the plant completed before the coming winter.

ESPANOLA, N. M.—Preparations are being made by the Espanola Milling & Elevator Company for the construction of a 2,000 hp. electric plant on the Santa Cruz River, north of Espanola. George Bond, of Trinidad, Col., and Frank Bond, of Espanola, are interested in the project.

PORTALES, N. M.—It is reported that bids will be received about September 15 by H. B. Ryther, city clerk, for the construction of an electric light plant and water works system. The cost of the work is estimated at $50,000. Burns & McDonnell, Scarritt Building, Kansas City, Mo., are the engineers.

BALDWINSVILLE, N. Y.—The Seneca River Power Company has commenced work on the construction of a new power plant at Baldwinsville, which will be equipped with three 100-kw generators direct connected to water wheels. The company will also use electricity generated at Niagara Falls and Seneca River water power. In addition to furnishing electricity for lamps the company will furnish electrical energy to industrial plants in Baldwinsville. Plans are being considered to increase the number of street lamps from 28 to 65, for which the company has quoted a price of $75 each per year.

BALLSTON, N. Y.—The Town Board has granted the Schenectady Railway Company a franchise to erect a transmission line across the Ballston Lake Road and the town's half of the town line road between Ballston and Malta. The company proposes to construct a transmission line from its new power station on the Buell farm, south of Ballston Spa, to the power house on the Hudson Valley line at Round Lake. The railway company will eventually receive electrical energy from the Delaware and Hudson station, near Mechanicville, making it independent of the Spier Falls plant.

BERLIN, N. Y.—The Berlin Electric Light, Heat & Power Company has been granted permission by the Public Service Commission, Second District, to issue $5,000 in capital stock for improvements and extension to its plant, and has also approved of the extension of the distributing system from Berlin to Petersburg, N. Y.

FULTON, N. Y.—The Niagara-Oswego Power Company has made a second application to the City Council for a franchise to furnish electricity in this city.

FREWSBURG, N. Y.—The Home Telephone Company of Frewsburg has purchased the plant and holdings of the Ivory Telephone Company, of Ivory, N. Y., and will take possession of the system Oct. 1.

GOUVERNEUR, N. Y.—The Village Board has awarded the contract for lighting the streets of the village for the next five years, commencing next October, to the Oswegatchie Light & Power Company. The company is to furnish arc lamps for $45 each per year with an all-night service, and 32-cp incandescent lamps for $10 per lamp per year. This will result in a saving of $1,000 per year on the present rates.

HILTON, N. Y.—The Village Trustees have awarded a contract to John E. Spencer for the installation of a street lighting system which calls for 43 tungsten lamps, 25 lamps of 40 cp and 18 of 32 cp, at an annual cost of $500 per year, with the privilege of adding any number of lamps at any time at the same rate. The system is to be installed on or before Nov. 1, 1909. Mr. Cooper was recently granted a franchise to erect an electric plant in the town.

SAG HARBOR, N. Y.—The Sag Harbor Electric Light & Power Company contemplates establishing a day service. George Kiernan is owner and manager.

SALEM, N. Y.—Plans are being considered by the Salem Light, Heat & Power Company for the installation of a day service for both lamps and motors; also the installation of an auxiliary gas engine of 150 hp for use in case the water supply gives out, and also to extend the power service to Raleigh, four miles distant. The power station of the company is located about four miles from the village on Battenkill Creek. W. H. Simpson is superintendent.

SIDNEY, N. Y.—Application has been made to the Board of Trustees by E. C. Bennett, of Pulaski, N. Y., for a franchise to construct an electric street railway from Sidney to Treadwell. The proposed railway will connect Sidney and Franklin.

CONCORD, N. C.—Work has been started on the grading of the new local street railway system for this town. J. T. Vanderford, of Salisbury, N. C., is interested in the project. Plans are also being considered for the electrical development of the section north of Concord.

LEXINGTON, N. C.—C. A. Hunt, Jr., manager of the Nokomis Cotton Mills, the Wennonah Cotton Mills and the Dacotah Cotton Mills, is making arrangements to operate the mills by electricity, which will be supplied from the Lexington transmission system of the Southern Power Company, of Charlotte, N. C. Electrical apparatus for changing the machinery to motor drive has been purchased. The plants operate about 34,200 spindles and 1,080 looms, and will require about 2,000 hp. of electrical energy.

WAKE FOREST, N. C.—Contracts have been awarded for construction and equipment of the new municipal electric lighting plant in Wake Forest. It is expected to have the system in operation by the middle of September. All the college buildings have been wired and will be furnished electrical service from the new power station.

CANAL DOVER, OHIO.—The Board of Public Service is asking for bids, to be opened August 21, for the installation of a complete electric lighting system, including a building 30 x 50 ft.; two 250-hp. gas engines; two 150-kw. three-phase, 60-cycles, 2,300-volt generators; 133 arc lamps, together with necessary switchboards, instruments and pole line construction.

CLEVELAND, OHIO.—The stockholders of the Cleveland Electric Illuminating Company have authorized a bond issue of $30,000,000, the proceeds to be used for future improvement and acquisitions.

CLEVES, OHIO.—A 25-year franchise has been granted to P. M. Hans to furnish electricity for light, heat and power in the village of Cleaves; also a contract for street lighting for a term of ten years with 20 or more 2000-cp arc lamps at $60 per lamp per year, on a moonlight schedule. Incandescent lamps will also be used for street lighting, the territory to be determined later. Electricity will be furnished to private consumers at a maximum rate of 10 cents per kw-hour. The company has not yet been organized and the system to be installed has not been decided upon.

COLUMBUS, OHIO.—Bids will be received until Sept. 9 for improvements to the penitentiary, which will include the installation of a power plant. An appropriation of $200,000 has been made for the work. Mariott & Allen, of Columbus, are architects and the Osborne Engineering Company, of Cleveland, Ohio, engineers. George A. Marvin is secretary of board of managers.

DAYTON, OHIO.—The Starbuck Electric Company, recently incorporated, with a capital stock of $25,000, has purchased the plant of the Starbuck Light & Power Company. It is said that the new company will make additions to the system.

IRONTON, OHIO.—William Lenley, representing A. E. Cox and associates, of Huntington, has applied to the County Commissioners for a franchise to construct an electric railway from Gallipolis to Ironton.

IRONTON, OHIO.—Application has been made to the County Commissioners by Thurman Braley, of Proctorville, for a franchise to construct and operate an electric railway from Ironton to Millersport.

NORTH BEND, OHIO.—P. M. Hans has been granted a 25-year franchise to furnish electricity for light, heat and motors in North Bend, and also a 10-year contract to light the streets of the village for a period of 10 years, to include 10 or more 2000-cp arc lamps.

MUSKOGEE, OKLA.—L. H. McHenry has applied to the City Council for a franchise to operate a lighting system in Muskogee.

OKEMAH, OKLA.—The contract for constructing an electric light plant and water works system for the town of Okemah has been awarded to the Squires Electric & Construction Company, of Kansas City, Mo. M. A. Earl & Company, of Muskogee, Okla., are consulting engineers.

RALSTON, OKLA.—At a special election held recently the citizens voted to issue $25,000 in bonds for the construction of an electric light plant and water works.

PORTLAND, ORE.—The Portland Railway, Light & Power Company has purchased a 200-kw, 2300-volt, 60-cycle synchronous motor of the Allis-Chalmers Company, of Milwaukee, Wis. W. H. Phillips is vice-president.

SPRAY, ORE.—D. A. Horron is reported to be making preparations to install a large water wheel to operate a pumping plant next season. If sufficient power can be secured a small electric plant will be erected.

BRISTOL, PA.—The Borough Council has awarded the contract for lighting the streets of the borough to the Bristol Electric Light & Power Company for a term of five years. The company is to furnish 17 arc lamps of 2000 cp at $95 each per year, and not less than 125 incandescent lamps at $20 each per year. Under the present contract the borough is paying $96 per arc lamp per year and $21.60 each for incandescent lamps.

FRANKLIN, PA.—The Petroleum Telephone Company is planning to place a portion of its telephone wires in Franklin underground this year.

HARRISBURG, PA.—The Central Pennsylvania Traction Company has decided to build several extensions in this city and also to rebuild the Third and Sixth Streets lines.

JOHNSTOWN, PA.—The Citizens' Light, Heat & Power Company will soon commence work on the erection of a transmission line which will supply electricity to the residents between Luna Park and Benscreek. The company has also closed a contract with the Valley Coal & Stone Company to furnish electricity to operate its mines; the equipment will include a 40-hp motor, a 150-hp motor-generator set, and two electric locomotives. August Weis is superintendent of the Citizens' company.

NORTHUMBERLAND, PA.—The Northumberland County Railway & Light Company is contemplating the extension of its railway in Northumberland to provide for the $3,000.000 construction work now being done by the Pennsylvania Railroad. The company also contemplates making connections with the electric railway at Lewisburg, Milton and Watsontown, during the present year. G. Parkman is secretary.

ORVISTON, PA.—The Hayes Run Fire Brick Company, of Orviston, it is reported, will erect a new fireproof building to replace the one recently destroyed by fire. The equipment will include a 300-hp engine, a smaller engine and generator, belting, shafting, elevator, conveyor, brick presses, etc. C. W. Keller is manager.

PITTSBURGH, PA.—The Pittsburgh & Lake Erie Railroad Company is considering plans for changing the motive power of its suburban lines between this city and Beaver. It is proposed to use gasoline-electric cars.

SCHUYLKILL HAVEN, PA.—Plans are being considered for the reconstruction of the municipal electric light plant.

SPEERS, PA.—The West Penn Electric Company, it is reported, is planning to erect a generating plant at Speers, opposite Belle Vernon, at an estimated cost of $1,000,000. G. R. Folds, of Connellsville, Pa., is general manager.

WERNERSVILLE, PA.—It is reported that the Wernersville Electric Light, Heat & Water Power Company proposes to enlarge its plant.

PROVIDENCE, R. I.—The Narragansett Electric Lighting Company is planning to install new magnetite open arc lamps on the principal squares in this city.

SUMTER, S. C.—The Sumter Telephone Company is planning to install the common battery system, at a cost of about $12,000.

WOONSOCKET, S. D.—The question of installing an electric lighting system in Woonsocket is under consideration.

HUMBOLDT, TENN.—The Missouri, Tennessee & Georgia Railroad Company has applied to the Board of Aldermen for a 45-year franchise to construct and operate its proposed electric railway over certain streets in Humboldt. The company proposes to construct a railway from Humboldt to Dyersburg, a distance of 35 miles. I. H. Dungan is president and general manager.

CANADIAN, TEX.—The Canadian Long Distance Telephone Company has increased its capital stock from $10,000 to $20,000.

DALLAS, TEX.—The Dallas Telephone Company has applied to the Board of Municipal Commissioners for permission to lay conduits for telephone wires in several streets in the city.

GREENVILLE, TEX.—J. W. Crotty and L. A. Miller, of Dallas, Tex., have applied to the City Council for a franchise to construct an electric railway in Greenville.

HOUSTON, TEX.—L. A. Anderson, representing the Westmoreland Railroad Company, has been granted a franchise by the County Commissioners to build an electric railway from Houston to the Westmoreland Farm, near Bellaire, a distance of seven miles. W. W. Baldwin is interested in the enterprise.

HOUSTON, TEX.—Sealed proposals will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until August 27, for installing a vacuum cleaning system in the U. S. post office and court house building, at Houston, Tex., in accordance with plans and specifications, copies of which may be secured at the above office or of the custodian at Houston, Tex. James Knox Taylor is supervising architect.

PORT ARTHUR, TEX.—The contract for the construction of the Port Arthur Railway has been awarded to H. E. Talbott & Company, of Dayton, Ohio. A charter will soon be applied for by the company, which will be known as the Port Arthur Traction Company. H. J. Myers will be president and general manager. The headquarters of the company are located at 503 Reobold Building, Dayton, Ohio.

SHERMAN, TEX.—Arrangements have been completed by the receiver of the Grayson County Telephone Co. for extensions and improvements to the telephone systems in Denison and Sherman owned by the company. The present plan provides for 300 additional instruments in Sherman and 200 in Denison and also the erection of a telephone line between Sherman and Greenville. C. A. Shock is receiver.

TEXAS CITY, TEX.—The Texas City Terminal Company has contracted with the Westinghouse Electric & Manufacturing Company to erect a large power plant to operate the wharf loading and unloading machinery. The power plant will be located inside of the town and electricity transmitted to the wharves to operate the trams and cranes. The cost of the plant is estimated at more than $100,000.

MODENA, UTAH.—Plans have been approved for the construction of a large power plant for the Gold Springs Mining & Power Company at Modena, work on construction of which will begin as soon as material can be secured. C. A. Short is president of the company.

BRATTLEBORO, VT.—It is reported that an agreement has been made between the Connecticut River Transmission Company and the Fitchburg Gas & Electric Company, of Fitchburg, Mass., whereby the local company will handle all of the electrical energy furnished by the Connecticut company in Fitchburg. Under the franchise of the power company it has the right to furnish electricity in units of 300 kw. to consumers, but has not the privilege of using the streets for either overhead or underground transmission, except to cross certain streets with its lines for the purpose of carrying its lines in and out of the city.

COEBURN, VA.—The Coeburn Light & Power Company is contemplating the installation of an ice plant and water-works system in the near future. T. B. Helliman is owner.

LURAY, VA.—Plans are being considered to replace the dam on the Shenandoah River, owned by the Shenandoah River Light & Power Com-

pany with a concrete structure. The company furnishes electricity for lamps in Luray and the Luray caverns.

RICHMOND, VA.—The Common Council on August 4 confirmed the award made by the committee on electricity to Hotchkiss & Gordon, agents of the General Electric Company, Schenectady, N. Y., for electrical equipment for the new municipal electric light plant. The amount involved in the contract is $96,592, the city reserving a 90-day option on the use of the lamps, transformers, and cut-outs now in use by the Virginia Railway & Power Company, in which event the price is to be reduced to $86,682. E. W. Trafford was engaged as supervising engineer of construction.

BELLINGHAM, WASH.—The Whatcom County Railway & Light Company has petitioned the City Council for a franchise to extend its line on Donovan Avenue.

HANFORD, WASH.—The Hanford Irrigation & Power Company has placed a contract with the Allis-Chalmers Company, of Milwaukee, Wis., for a duplication of the generating system of its plant at Priest Rapids, which will include one 1,000 hp. vertical triplex, open-flume turbine; one oil pressure governor complete; one 900-kw., 60-cycle, 2,200-volt alternator; three 400-kw., oil-filled, water-cooled transformers and switchboard complete. The present equipment of the plant was furnished by the Allis-Chalmers Company.

HOQUIAM, WASH.—Extensive improvements are contemplated by the Pacific States Telephone & Telegraph Company, which will involve an expenditure of $100,000.

ODESSA, WASH.—The Town Council is reported to have granted the Washington Water Power Company, of Spokane, Wash., a franchise to furnish electricity in this city. A transmission line will be extended from the Harrington-Sprague line to Odessa, a distance of about 20 miles. The cost of the transmission line and the distributing system is estimated at $50,000.

SEATTLE, WASH.—The City Council has passed an ordinance requiring all public service corporations to place their wires underground in the business district of the city.

TACOMA, WASH.—Plans for the proposed municipal power plant on the Nisqually River have been changed to develop 30,000 hp instead of 20,000 hp, as originally intended. The plans call for the construction of a dam 45 ft. high and 45 ft. at the base. A station will be erected at South C and Twenty-fifth Streets in this city. The cost of the entire plant is estimated at $2,000,000. Frank C. Kelsey is engineer in charge of the work.

TACOMA, WASH.—Proposals will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until August 31, for installing a vacuum cleaning system in the U. S. post office, court house and custom house, Tacoma, Wash., in accordance with drawings and specifications, copies of which may be obtained at the above office or of the custodian, Tacoma, Wash. James Knox Taylor is supervising architect.

LARSEN, WIS.—The capital stock of the Larsen Telephone Company has been increased from $5,000 to $10,000.

LINDEN, WIS.—A franchise has been granted to the Mineral Point Electric Light Company, of Mineral Point, Wis., to furnish electricity for lamps and motors in Linden. F. C. Ludden, of Mineral Point, is manager.

MELLEN, WIS.—The Mellen Water & Light Company, it is said, will make extensions and improvements to its plant if granted a 15-year contract by the city.

MILWAUKEE, WIS.—It is reported that Mayor D. S. Rose will recommend the installation of electric generating machinery in the garbage incinerating plant to furnish electricity for lighting the suburbs. Rudolph Hering, 110 Broadway, New York, N. Y., is consulting engineer.

CALGARY, ALB., CAN.—Plans have been completed by Smith, Kerry & Chace, of Toronto, Ont., and contracts will soon be awarded for the construction of the main dam, headworks, power house, retaining walls, erection of steel racks, penstocks, sluice gates and other work necessary for the plant of the Calgary Power & Transmission Company, on the Bow River, about 45 miles west of Calgary.

BERLIN, ONT., CAN.—The ratepayers have approved the by-law to raise $10,000 for double tracking a section of the Berlin & Waterloo Street Railway between Berlin and Waterloo.

CORNWALL, ONT., CAN.—Plans are being considered for the construction of a large power plant at the foot of the Long Sault Rapids, near Cornwall, the plant to be built and managed jointly by the Long Sault Development Company, on the American side, and the St. Lawrence River Company, on the Canadian side. The latter company already operates a plant at Mill Roches, which furnishes electricity for lamps and motors at the locks and in Cornwall. Under the present plan it is proposed to utilize the Long Sault Rapids as a head race for three large power houses, and will include the construction of a large dam 4,000 ft. in length, from the lower part of the rapids to the upper end of Barnhart's Island, to bring the waters of the Sault to the power houses, the construction of three power houses, straightening of the course of the river channels and other engineering work, which will involve an expenditure of about $20,000,000. It is estimated that 100,000 hp. can be developed. The companies are trying to secure a charter from the Canadian Parliament and the United States Congress.

TORONTO, ONT., CAN.—Contracts for the construction of eight transformer stations have been awarded by the Hydro-Electric Power Commission. The contract for constructing the stations at St. Mary's, Stratford, Berlin and Guelph was awarded to Edge & Gutteridge, of Seaforth, at a cost of $18,000 each; the buildings at Preston, Paris, Woodstock and St. Thomas will be erected by John Hayman & Son, of London, for $19,850 each.

MONTREAL, QUE., CAN.—Work has commenced on the construction of the electric plant of the Canadian Light, Heat & Power Company at St. Timothee. It is the intention of the company to develop 21,000 hp., which will involve an expenditure of $2,400,000. It is claimed that 72,000 hp. can be obtained by deepening and widening the canal.

## *New Industrial Companies.*

THE AMERICAN ELECTRIC TOOL COMPANY, of Petersburg, Va., will be incorporated, with a capital stock of $1,000,000, and the following-named officers: Louis Paulero, president; W. G. Andrews, vice-president; W. H. Wilcox, secretary and treasurer. The company is a reorganization of the Virginia Electric Tool & Manufacturing Company, which manufactures electric hammers and other appliances, and will take over the assets of the old company and enlarge the plant.

THE BONOM INTERNATIONAL STEAM TURBINE COMPANY has filed articles with the Secretary of State at Dover, Del., with a capital stock of $1,000,000. The incorporators are: G. R. de Montlord, A. T. de Montlord and T. A. Schneider, Jr., of Winslow, N. J.

THE CAPITOL HILL GAS & ELECTRIC MANUFACTURING & SUPPLY COMPANY, of Capitol Hill, Okla., has been incorporated, with a capital stock of $5,000, to manufacture gas and electric supplies. The incorporators are: A. W. Aubrey, W. L. Harmon, of Capitol Hill, and D. F. Sullivan, of Oklahoma City, Okla.

THE DELAWARE CONSTRUCTION COMPANY, of Wilmington, Del., has filed articles of incorporation with a capital stock of $25,000. The incorporators are: J. B. Talley, W. P. Jorde, H. H. Thayer, Jr., and M. S. Molloy, of Wilmington, Del.

THE ELECTRIC CLEANING COMPANY, of Fayetteville, N. C., has been chartered by F. H. Bradley and associates, with a capital of $25,000, to operate electrically driven renovating machines ,etc.

THE ELECTRICAL INDUSTRIES MANUFACTURING COMPANY, of New York, N. Y., has been chartered, with a capital stock of $40,000, by J. S. Leach, E. W. F. Mammen, E. M. Mammen and K. E. Leach, of Brooklyn, N. Y. The company proposes to manufacture electrical, medical, surgical and scientific apparatus, tools, dies and devices.

THE GELBERT VON NAGY ENGINEERING & MANUFACTURING COMPANY, of Brooklyn, N. Y., has filed articles of incorporation with a capital stock of $25,000, as mechanical and electrical engineers, machinists, founders, metal workers, etc. The incorporators are: J. Gelbert, D. von Nagy and N. Waxman, of Brooklyn, N. Y.

THE GEORGE L. FISH ELECTRIC COMPANY, of Lafayette, Ind., has been incorporated with a capital stock of $25,000 for the purpose of manufacturing electrical supplies. The directors are: George L. Fish, John McHugh and W. F. Frey.

THE GRIMM MANUFACTURING COMPANY, of Buffalo, N. Y., has filed articles of incorporation, with a capital stock of $5,000. The incorporators are: John M. Hull, Edward L. Grimm and Morgan P. Jackson, all of Buffalo, N. Y. The company proposes to manufacture motors, engines and wood-working machinery.

THE HALL CAR COMPANY, of New York, N. Y., has been incorporated by T. M. May, B. H. Howell and H. P. Hall. The company is capitalized at $20,000 and proposes to manufacture engines, motors, cars, locomotives and vehicles of all kinds.

THE HARRISON ENGINEERING COMPANY, of New York, N. Y., has been incorporated with a capital stock of $500,000 to manufacture machinery, particularly for heating and ventilation. The incorporators are: P. B. Gibson, H. E. Harris, both of New York, N. Y., and B. S. Harrison, of Brooklyn, N. Y.

THE ILLMER GAS ENGINE COMPANY has filed articles of incorporation with the Secretary of State at Dover, Del. The company is capitalized at $100,000, and the incorporators are: L. Illmer, Jr., W. Bohren, Cincinnati, Ohio, and E. J. Kunze, of Newark, N. J.

THE JACKSON PERFECT METER LOCK COMPANY, of New York, N. Y., has been incorporated with a capital stock of $100,000, for the purpose of manufacturing meter locks. The incorporators are: E. J. Forhan, H. M. Browne and J. J. Harper, all of New York, N. Y.

THE KELLER-McMANUS COMPANY, of Camden, N. J., has been incorporated by S. Moor, W. R. Watson and F. A. Kuntz, of Camden, N. J. The company proposes to manufacture portable or stationary vacuum dry cleaning machinery, etc.

THE McCARTNEY BOILER COMPANY, of Bessemer, Ala., has been incorporated by James McCartney, of Mobile, Ala.; W. J. Long, G. H. Stevenson, H. E. Bumby, Albert Ross and W. W. Hollinsworth, of Bessemer, Ala. The company is capitalized at $50,000 and proposes to manufacture boilers, engines and other power-plant equipment.

THE PERFECT GAS CONTROLLER & FIXTURE COMPANY, of Chicago, Ill., has been chartered with a capital stock of $30,000, by H.

W. Hill, F. I. Ellis and C. J. E. Anderson. The company proposes to manufacture gas and electric fixtures.

THE P. & W. VACUUM CLEANING COMPANY, of New York, N. Y., has been chartered by Walter Thompson, Jr., D. G. C. Levick, of New York, N. Y., and Manfred S. Uhlfelder, Yonkers, N. Y. The company proposes to manufacture vacuum carpet-cleaning machines.

THE SOUTHERN ENGINEERING COMPANY, of Texarkana, Ark., has been chartered by J. Graham Miller, president; J. M. Walsh, vice-president, and H. M. Barney, secretary and treasurer. The company proposes to act as manufacturers' agents for gas, steam, electrical equipment, supplies, etc. A number of high class agencies have already been secured and the company is prepared to handle any proposition offered.

THE UNITED INVENTIVE COMPANY, of New York, N. Y., has been granted a charter with a capital stock of $50,000, to manufacture "Flaming Beak Ignition" spark plugs, coils and electrical machinery and supplies. The incorporators are: J. W. Ebbs, of Englewood Cliffs, N. J.; H. H. Nieman, of New York, N. Y., and A. A. Kelly of Montclair, N. J.

THE UNIVERSAL CARTRIDGE COMPANY, of New York, N. Y., has been chartered, with a capital stock of $10,000, to manufacture mill supplies, engines, boilers, etc., by Joseph B. Doran, John J. Doran and R. A. Greenblatt, all of Yonkers, N. Y.

THE VIR CONSOLIDATED ENGINEERING COMPANY, of Portland, Maine, has been incorporated with a capital stock of $250,000 for the purpose of manufacturing machinery, engines, etc. C. E. Eaton is president and A. F. Jones treasurer.

THE WARNER ELECTRIC COMPANY, of Muncie, Ind., has been incorporated with a capital stock of $100,000. The object of the corporation is to establish, equip and operate a large plant for the manufacture of electric machinery, devices, supplies, etc. A. L. Johnson, W. E. Hitchcock, R. C. Stone and C. E. Davis are directors.

## Company Elections.

MAQUOKETA, IA.—At the annual meeting of the Barnes Electric Light & Power Company the following officers were elected: A. B. Bowen, president; C. Von Schrader, treasurer; E. W. Farr, vice-president; J. F. Barnes, secretary.

GARDNER, MASS.—At the annual meeting of the Gardner Electric Light Company held recently the folowing-named officers were elected: Arthur P. Derby, president; Thatcher B. Dunn, vice-president, and Francis S. Whittemore, treasurer and clerk.

SUPERIOR, WIS.—At the annual meeting of the Superior Water, Light & Power Company the following officers were elected: William R. Merriam, of Washington, D. C., president; Robert R. Dunn, of St. Paul, Minn., vice-president; V. M. Watkins, of St. Paul, Minn., treasurer, and W. H. Winslow, of Superior, secretary and general manager.

## New Incorporations.

JONESBORO, ARK.—The People's Telephone Company has been organized with a capital stock of $10,000, to construct and operate telephone lines throughout the eastern part of Craighead County.

SANDPOINT, IDAHO.—The Idaho Power & Concentrating Company has been incorporated by R. C. Reinerston, of Park River, N. D.; Ralph Reinerston and G. H. Hipke, of Sandpoint, Idaho; C. L. Finneseth, of Park River, N. D., and A. K. Erickson, of Story, Ia. The company is capitalized at $500,000 and proposes to develop the water power of Trestle Creek between Sandpoint and Hope, Idaho, and also proposes to erect a concentrating plant on the lake shore near the Northern Pacific Railway tracks east of Sandpoint. It is proposed to develop 1000 hp, which will be used to operate the concentrator plant; also the mining properties on the lake shore. Electricity will also be transmitted to Sandpoint and other places.

BROOKPORT, ILL.—The Ohio Valley Traction Company has been chartered to construct an electric railway from a point near Golconda, via Brookport, to Joppa, Ill. The company is capitalized at $10,000, and the incorporators are: O. H. Margrave, G. W. Tucker, William Pell, H. W. Holifield and William Harrington, of Brookport; Chenault Webb and Robert C. Leeper, of Unionville, and C. L. Robertson, of Paducah, Ky.

WESTFIELD, ILL.—The Westfield Mutual Telephone Company has been incorporated with a capital stock of $2,500 by J. J. Hinkley, E. E. Robbins, John Hornbrook and Jackson Hardin.

AUBURN, KY.—The Auburn Home Telephone Company has been incorporated, with a capital stock of $3,000, by D. B. Williams, V. G. Price, Edgar Harris and others.

AUGUSTA, MAINE.—The Gulf States Telephone Corporation has been incorporated with a capital stock of $2,500,000 to maintain and operate telephone and telegraph lines. M. F. Sheehan is president and treasurer.

FORT FAIRFIELD, MAINE.—Articles of incorporation have been filed for the Maple Grove Electric Company, with a capital stock of $50,000. The officers are: Isaac Conant, president; C. M. Waldron, treasurer, and J. R. Thurlow, clerk, all of Fort Fairfield, Maine.

ROCKLAND, MAINE.—The International Tidal Power Company has been incorporated with a capital stock of $1,500,000 for the purpose of taking over the patent rights of an automatic tidal air compressor invented by William O. Webber, of Boston, Mass. The company does not intend to build plants, but to grant leases to subsidiary companies. The officers are: William O. Webber, of Boston, Mass., president; Edward B. Macallister, of Rockland, Maine, vice-president; F. Ernest Holman, of Rockland, treasurer, and Dudley M. Holman, of Taunton, Mass., secretary.

KALAMAZOO, MICH.—The Michigan & Chicago Westbound Railway Company has been chartered, with a capital stock of $3,000,000, to construct an electric railway between Kalamazoo and Grand Rapids. Alfred H. Brown, of Chicago, Ill., is one of the incorporators.

ROCHESTER, MINN.—Articles of incorporation have been filed for the Zumbro Power Company by Charles H. Armstrong, Henry O. Christensen and John M. Norton. The company is capitalized at $300,000 and proposes to erect a dam across the Zumbro River, about 114 miles above Rochester, where it is estimated that about 600 hp can be developed. L. P. Wolff, of St. Paul, Minn., is engineer.

JACKSON, MISS.—The Jackson Interurban Railroad, Light & Power Company has been incorporated, with a capital stock of $100,000, for the purpose of constructing a railway from Jackson to Clinton, a distance of about 10 miles. The company also proposes to operate gas, electric light and power plants. The incorporators are: R. E. Kennington, W. J. Davis, W. H. Watkins, J. Ehrman, H. L. Hicks and others, of Jackson; J. W. Provine and D. N. McLean, of Clinton.

GREAT FALLS, MONT.—Articles of incorporation have been filed for the Great Falls Telephone Company for the purpose of installing a telephone system in Great Falls. The company is a branch of the Montana Independent Telephone Company and is capitalized at $500,000. F. R. Vandeputte is president; George H. Stanton, vice-president and treasurer, and R. T. Durett, secretary and managing director. The company proposes to erect a building as soon as possible, and expects to have its system in operation by Dec. 1.

GREENSBORO, N. C.—The Southeast Guilford Telephone Company has been chartered with a capital stock of $24,500 by C. S. Gilmer, of Greensboro; J. H. Bowman, of Liberty; C. M. Boobb, of Julian, and others. The company proposes to operate a farmers' exchange and telephone service in Greensboro.

MONROE, N. C.—The Union Telephone Company has been incorporated, with a capital stock of $25,000, by J. M. Fairly, F. E. and F. H. Wolfe. The address of the company is Monroe, Rural Free Delivery No. 5.

JERSEY CITY, N. J.—The Montana, Wyoming & Southern Railroad Company has been granted a certificate of incorporation, with a capital stock of $5,000,000. The company proposes to operate railroads, tramways and terminals. The incorporators are: Frank S. Gannon, William H. Seibert, William C. Langley, Charles W. Fernall and James J. Molley all of New York, N. Y.

NEW YORK, N. Y.—The Trackless Trolley Company, of New York City, has been incorporated, with a capital stock of $150,000, by Charles E. Barrett, of New York, N. Y.; A. Livingston Norman and S. E. Wiener, of Brooklyn, N. Y. Mr. Norman, counsel for the company, states that the company has secured the American rights to a system of transportation which has been used successfully in Germany. By this system an omnibus is run over roads or pavements, power being furnished by an overhead trolley.

ROCHESTER, N. Y.—The Livingston-Niagara Power Company has been incorporated with a capital stock of $100,000 by C. J. Brown, W. S. Riley and W. W. Dake, of Rochester, N. Y., for the purpose of supplying light, heat and power.

COLUMBUS, OHIO.—The Municipal Utilities Company has filed articles of incorporation for the purpose of taking advantage of a law passed some time ago in which municipalities were given authority to lease gas, electric light and power or water plants from private corporations for a term of years with the privilege of purchasing same. The company is capitalized at $25,000.

ALVA, OKLA.—The Valley Telephone Company has filed articles of incorporation with a capital stock of $3,000. The directors are W. D. Anderson, C. J. Funk and Z. B. Anderson.

COWLINGTON, OKLA.—The Cowling Spira Telephone Company has been incorporated with a capital stock of $1,000 by T. L. Tharel, W. E. McGeown, S. D. N. Nelson, J. O. Terrell, R. L. Redwine and H. B. Lowrie, all of Cowlington.

ENID, OKLA.—The Enid Central Traction Company has been incorporated with a capital stock of $1,000,000 by W. H. Stewart, R. W. Whittinghill, C. E. Burkhart, of Enid, Okla.; M. F. Machon and J. W. Smith, of Toledo, Ohio.

BAKER CITY, ORE.—Articles of incorporation have been filed for the Baker Interurban Railway Company by Thomas B. Neuhausen, Anthony Mohr and A. K. Bentley. The company is capitalized at $50,000 and proposes to construct electric railways in the vicinity of Baker City, Ore.

JOHNSTOWN, PA.—A charter has been granted to the Johnstown & Gallitzin Railway Company to construct an electric railway 32 miles in length, to connect Johnstown and Gallitzin and intervening towns. The officers of the company are: Wallace Sherbine, president; Alian Sher-

bine, secretary; H. W. Storey, treasurer, and G. U. G. Holman, general manager and electrical engineer.

DUNCAN, S. C.—The Duncan Telephone Company has been incorporated with a capital stock of $2,000.

PIERRE, S. D.—The Pierre & Southeastern Telephone Company has been chartered with a capital stock of $100,000 for the purpose of doing a long-distance telephone business in the country south and southeast of this city. The incorporators are: Albert Gunderson, Frank B. Rowe, of Pierre, S. D., and Albert Saveland, of Chicago, Ill.

CLINTON, TENN.—The Cook Creek Electric Light & Railway Company has been granted a charter with a capital stock of $25,000 to construct an electric railway in Anderson County. The incorporators are: Charles Loyd, J. P. Stanton, E. M. Beasley, J. S. Stanton and S. B. Faris.

SALT LAKE CITY, UTAH.—The Utach & Idaho Railroad Company has been incorporated with a capital stock of $160,000 to construct a railway to be operated either by steam or electricity from a point on the Ogden & Lucin Railroad at or near Salina, through Kelton Pass to the State line, and with the Minindoka & Southwestern Railroad, near Burley, Idaho, 150 miles in length. The officers are: W. H. Bancroft, president; D. E. Burley, vice-president; G. K. Smith, secretary, and C. H. Jenkinson, treasurer.

FREDERICKS HALL, VA.—The Fredericks Hall Telephone Company, capitalized at $5,000, has been incorporated, and the following officers elected: President, E. A. Ferrell; vice-president, J. H. Crunk; secretary, G. R. Poindexter; treasurer, E. H. Poindexter.

ONANCOCK, VA.—The Onancock Light Company has been incorporated with a capital stock of $5,000 for the purpose of constructing an electric light plant at Onancock. The officers of the company are: H. F. Parks, President; Horace Wiltbank, secretary and treasurer.

DEEP VALLEY, W. VA.—Articles of incorporation have been filed by the Farmers & Merchants' Telephone Company of this city. It is capitalized at $5,000, and Arlington Dotson is one of the incorporators.

GLEN JEAN, W. VA.—Articles of incorporation have been filed for the Fayette Public Service Corporation by R. J. Stegal, J. S. Staton and E. F. Thacker, of Glen Jean; R. H. Dickinson and Ross M. Reigel, of Harrisburg, Pa. The company proposes to install an electric power plant.

MARTINSBURG, W. VA.—Articles of incorporation have been filed for the Preston Power Company by William S. Downs, of Kingwood, W. Va.; Frank E. Carver, of Brandonville, W. Va.; F. W. Sheidenheim and Victor Hammell, of Connellsville, Pa., and Ross M. Reigel, of Harrisburg, Pa. The company proposes to construct a hydro-electric plant on Sandy Run, at an estimated cose of $100,000.

MILAN, W. VA.—The South Fork Mutual Company has been incorporated with a capital stock of $5,000 by N. D. Wilson, N. G. Dasher, G. H. Simon and others.

FOREST JUNCTION, WIS.—Articles of incorporation have been filed by the Calumet Telephone Company. It has a capital stock of $3,500, and William Hacker is one of the incorporators.

IRON RIDGE, WIS.—The Hubbard Farmers' Telephone Company, capitalized at $2,000, has filed articles of incorporation. H. Bilymen and others are interested.

LARSEN, WIS.—Articles of incorporation have been filed by the Larsen Telephone Company. It has a capital stock of $5,000, and the incorporators are Neils Jensen, A. H. Hinman and Louis Sorenson.

MADISON, WIS.—The Yellow River Telephone Company, of Yellow River, Wis., has been incorporated with a capital stock of $3,000 by Arthur Wright and others.

STURGEON BAY, WIS.—The Shifo Telephone Company has been incorporated with a capital stock of $2,000 by G. E. Johnson, C. Olson and Herman Foth.

SUPERIOR, WIS.—Articles of incorporation have been filed for the Superior Traction Company by Richard Russell, P. J. Eckstand and S. L. Perrin. The company is capitalized at $100,000 and proposes to operate an electric railway system in Superior.

COWLEY, ALTA., CAN.—The Farmers' Mutual Telephone Company, with a capital of $5,000, has been organized here. Construction will be started this summer.

EASTON'S CORNERS, ONT., CAN.—The Walford Rural Telephone Company has been incorporated, with W. H. Watts as secretary.

HAWKESTONE, ONT., CAN.—The Oro Telephone Company has been incorporated, with headquarters in this city. For further information address R. W. Metcalf.

ELLISBORO, SASK., CAN.—The Ellisboro Rural Telephone Company has been incorporated for the purpose of building a rural telephone system.

MAPLE CREEK, SASK., CAN.—The Bay Creek Telephone Company, with headquarters in this city, has filed articles of incorporation.

REGINA, SASK., CAN.—The Central Rural Telephone Company has been incorporated for the purpose of building rural lines from here.

REGINA, SASK., CAN.—The Rose Plain Telephone Company has been incorporated to build rural telephone lines in the vicinity of this city.

ROULEAU, SASK., CAN.—The Riverside Rural Telephone Company, which expects to operate in this city, has filed incorporation papers.

## Personal.

MR. A. M. CANTRILL, son of Mr. S. Cantrill, superintendent of the Denver City Tramways, who was formerly manager of the Pueblo Gas & Fuel Company, has assumed the management of the Spokane Gas Company.

MR. H. D. FRUEAUFF has been placed in charge of the Pueblo Gas & Fuel Company as manager of that concern. Mr. Frueauff is a brother of Mr. Frank W. Frueauff, general manager of the Denver Gas & Electric Company and president of the National Electric Light Association.

MR. C. E. ALLEN, who has been connected with the General Electric Company at both its Lynn and Schenectady works, has tendered his resignation to take effect during the present month. For the past 10 years Mr. Allen has devoted considerable time and thought to the development and introduction of improved designs of transformers, and was granted patents for the divided core type arrangement, which has been upon the market for about two years.

MR. HENRY B. OTIS, who has been connected with the electrical industry in Chicago for several years, has accepted an appointment with the contract department of the Sanitary District, devoting his attention particularly to the soliciting of electric power business for the Drainage Canal water-power plant. Mr. Otis was formerly the Chicago manager for the Cutter Electrical & Manufacturing Company, of Philadelphia, and before that he was connected with the Western Electric Company for some time.

MR. FRANK F. FOWLE, consulting electrical engineer, Marquette Building, Chicago, has recently made a preliminary examination of the water mains at St. Paul, Minn., to determine the present rate of damage by electrolysis. The matter was first investigated in 1901 and is again being studied by the water board. Mr. Fowle has also been engaged in an investigation as to rates and service at Beloit, Wis., and on a steam and water power development for the Oregon Power Company, of Oregon, Ill.

MR. T. B. GAY, secretary and purchasing agent of the Norfolk & Portsmouth Traction Company, of Norfolk, Va., has tendered his resignation effective Aug. 15, and will take up the practice of his profession as a lawyer in Richmond, Va., on Oct. 1. Mr. Gay is a graduate from the Law School of the University of Virginia, and was admitted to the Virginia Bar several years ago. As an associate member of Messrs. Munford, Hunton, Williams & Anderson, Mr. Gay enters with exceptional opportunities a leading law firm of the State.

MR. WILLIAM B. HALE, a consulting electrical engineer of the City of Mexico, has been visiting the United States. He was the official delegate from the Mexico section of the American Institute of Electrical Engineers to the recent Frontenac convention, and before returning took occasion to call on his friends in various American cities. Mr. Hale is retained by the Mexican Government as an adviser to the Department of Federal Telegraphs, and is also the Mexican representative of the Weston Electrical Instrument Company and the Bristol Company. He was formerly a resident of Chicago, where he was connected with the Western Electric Company.

## Obituary.

MR. JAMES SUGDEN, a prominent electrical contractor of Malden, Mass., died at his home in Malden, Aug. 10. He was 57 years old. He was formerly identified with the General Electric Company, the Edison Company, and the New England Telephone & Telegraph Company, until a few years ago, when he started in business for himself. He js survived by a widow, two sons and three daughters.

CAPTAIN HERMAN P. SCHUYLER, assistant treasurer of the General Electric Company, and one of the best-known credit men in this country, died on Aug. 14 at his home in Albany, aged 67 years. The late Mr. Schuyler enjoyed an acquaintance which extended throughout this country and Europe. He was born in the Schuyler home in Albany County, Sept. 13, 1842, and was a direct descendant of Gen. Philip Schuyler of Revolutionary fame. With the beginning of the Civil War he went West and enlisted in the First Wisconsin Regiment, where he remained until the end of the war, being promoted to first lieutenant. In 1864 he was appointed head of the Ordnance Department of the Army Corps with headquarters at the Watervliet Arsenal. Resigning this position in 1870 he became the head of the sales department of the Troy Steel & Iron Company, of Troy, N. Y. In 1887 Captain Schuyler went to New York City to become private secretary of the late H. H. Rogers of the Standard Oil Company. Three years later he was called to Philadelphia to become head of the sales department of the Wellman Steel & Iron Company at Thurlow, Pa. His marked ability soon after won for him the position of assistant treasurer in charge of credits of the General Electric Company in 1893. The deceased was a member of the Fort Orange Club of Albany, Troy Club of Troy and the Army and Navy Club, the Loyal Legion and the Holland Society of New York City. Captain Schuyler is survived by a daughter, Mrs. R. C. Yates, and a son, Mr. Herman P. Schuyler, Jr., both of Chicago. The funeral was held at the chapel, Rural Cemetery, Albany, Aug. 16.

MR. A. A. KNUDSON.—We record with deep regret the death of Mr. Adolphus A. Knudson, the electrical engineer, at Meadville, Pa.

The occurrence was very sudden and unexpected. Mr. Knudson had gone to Meadville last week from New York on behalf of the city water and light department to investigate some electrolytic conditions in the water mains, and on Friday afternoon, Aug. 13, was at the old pumping station with Superintendent Ellsworth inspecting the plant when he collapsed; and soon after all was over. The physician on arrival was able to do nothing. The day was very warm and oppressive, and Mr. Knudson had complained of feeling unwell, but insisted on going forward with his work. Mr. Knudson was the son of a Norwegian sea captain, and as a youth accompanied his father, but did not like the career, and turned his attention to electricity. He was early connected with the financial ticker interests in New York, and brought out a ticker of his own that was well known. Indeed, he was a man of considerable inventive and mechanical ability and made various improvements in electrical apparatus. He gradually enlarged his sphere of work as the electrical arts grew, and for some years past had given almost his entire time to electrolysis cases as a specialty. Some years ago he organized and conducted a very successful electrical exhibition at St. John, N. B., the first every held in the Maritime Provinces. He was a full member of the American Institute of Electrical Engineers, which he joined in 1887, and also an old member of the New York Electrical Society. He took an active interest in the welfare and progress of both bodies. Mr. Knudson leaves a widow and a wide circle of friends and acquaintances in the electrical field.

## Trade Publications.

REFLECTORS.—Bulletin No. 23 of the Holophane Company, 227 Fulton Street, New York, is devoted to reflectors for factory and shop lighting.

BEARINGS.—The Hill Clutch Company, Cleveland, Ohio, has issued as the first of a series of booklets a bulletin devoted to line-shaft bearings. The bearings discussed are of the collar-oiling type.

TURBINE PUMPS.—Centrifugal pumps, arranged for direct connection with induction motors, are briefly described and well illustrated in bulletin H. issued by the Lea Equipment Company, 90 West Street, New York.

STEAM TURBINES.—Much information concerning the constructive features and operating characteristics of small steam turbines is given in a catalog issued by the E. W. Bliss Company, 17 Adams Street, Brooklyn, N. Y.

STEAM TURBINES.—Leaflet No. 2117 of the British Thomson-Houston Company, Ltd., gives a list of Curtis turbines installed or in course of erection. The total rating is 1,378,580 kw, and the aggregate selling price about $32,000,000.

DRILLS.—The Cleveland Twist Drill Company, Cleveland, Ohio, has issued a folder devoted to its high-speed, flat-twist drill, with a Paragon flat-taper shank. It is claimed that this drill is as tough as can possibly be made for use at high speed.

DOMESTIC ENGINEERING.—The H. W. Johns-Manville Company, 100 William Street, New York, is distributing a folder entitled "How to Economize in the Home." This folder deals with the numerous mechanical devices employed in the modern residence.

HIGH-VOLTAGE DISTRIBUTING TRANSFORMERS intended for connection along high-voltage transmission circuits for delivering energy to small consumers are briefly described in Bulletin No. 1093 of the Pittsburgh Transformer Company, Pittsburgh, Pa.

HYDRAULIC WHEEL PRESSES.—Hydraulic presses intended for mounting car wheels and axles are illustrated in a catalog issued by E. R. Caldwell & Company, 34 Hilton Street, Bradford, Pa. The catalog contains an imposing list of companies by whom the presses described are used.

ELECTRICAL SPECIALTIES.—The Thordarson Electric Manufacturing Company, 216 Jefferson Street, Chicago, Ill., has issued a well-illustrated catalog devoted to ignition coils of the jump-spark and make-and-break types, transformers of large and small range and special laboratory equipments.

COAL-HANDLING MACHINERY.—Catalog No. 091 of the C. W. Hunt Company, West New Brighton, N. Y., contains much interesting information relating to machinery for handling coal and ore. The information is largely of an engineering nature, and in its presentation effective use is made of photographs and line illustrations.

LIFTING MAGNETS.—The Electric Controller & Manufacturing Company, of Cleveland, Ohio, is distributing a mailing folder containing many well-prepared illustrations showing its lifting magnets in actual service. It is claimed when used in steel mills that each magnet produces a saving of from $10 to $40 per day in handling iron.

ARC LAMPS.—The Regina Arc Lamp Works, Ltd., Cologne-Sulz, Germany, have published in English a catalog giving a good technical description of its Conta lamp, which is of the self-regulating type without clockwork. This lamp can be used with either direct current or alternating current, and is suitable for either flaming electrodes or electrodes of pure carbon.

TRANSFORMERS.—In Bulletin No. 86 of the Wagner Electric Manufacturing Company, St. Louis, Mo., is given a good description of the desirable features in transformer performance, special attention being paid to the magnetizing current, which is referred to as the "leakage current." The bulletin describes particularly single-phase core-type transformers for central-station service.

ELECTRIC DRIVE FOR LARGE PRINTING PRESSES.—The General Electric Company has issued Bulletin No. 4672, entitled "Electric Drive for Large Printing Presses," which deals with a subject of vital importance to the up-to-date printer. The bulletin refers to certain electrical installations used in connection with such work, and describes the most modern method of operation and control of large presses.

LIGHTING FIXTURES.—The Central Electric Company, Chicago, Ill., is distributing an attractive set of plates showing a reproduction of five artistic lighting fixtures. Accompanying the plates is a card bearing the inscription: "A lighting effect must have two inceptions: First, in the designer's thought, made apparent by the use of the pencil. Second, its reproduction in metals by craftsmen of sterling worth. It is the service of such an organization that we offer you."

WIRELESS TELEGRAPH APPARATUS.—The Central Electric Company, Chicago, Ill., is distributing several folders descriptive of wireless telegraph apparatus suitable for experimental and private installations. A complete description is given of the various sizes of receivers, detectors and sending sets. Several new types of spark and tuning coils are described which, together with complete diagrams of connections, should prove of much interest and service to those engaged in wireless telegraph work.

SLIDE RULE.—The Keuffel & Esser Company, Hoboken, N. J., has issued an eight-page folder entitled "Log Log Duplex Slide-Rules." It is stated that with the device described any problem can be solved that can be handled with the ordinary slide-rule, and many others heretofore unattempted in slide-rule work. This slide-rule should prove valuable in the solution of numerous electrical calculations. It will extract any root or raise to any power—integral or fractional. Hyperbolic logarithms are read directly, while sines, tangents and co-tangents are given from one second to 90 deg.

AUTOMOBILE MOTORS.—In its most recent catalog the Woods Motor Vehicle Company, of Chicago, does not give a horse-power rating for the electric motors used on its electric automobiles. In explaining this fact the company makes the following interesting statement: "The motor is not rated as to horse-power. It has been determined that, with automobiles as in railway practice, horse-power rating cannot be satisfactorily stated. The horse-power rating of a motor is dependent upon its temperature, and, inasmuch as heat accumulates, it is very easy to understand that this rating must, therefore, depend upon the number of consecutive hours the motor is intended to run. The Woods motor is designed to run the vehicle longer than the rated capacity of the battery, so that the battery really becomes a safety-valve against dangerous heating of the motor."

## Business Notes.

THE BEAVER ELECTRIC CONSTRUCTION COMPANY, of Chicago, which does electric contracting, has increased its capital stock from $10,000 to $15,000, owing to the demands of a growing business.

MR. H. VON SCHON, whose principal office is in Detroit, Mich., following hydro-electric practice as a specialty, has arranged with Mr. Thatcher T. P. Luquer to represent him in New York City with office at 103 Park Avenue.

THE NEW CASTLE (IND.) ELECTRIC SIGN COMPANY has changed its name to the Elmo Electric & Manufacturing Company. The company's plant will be enlarged and a wider range of electric appliances and devices will be made. Philip W. Moore is president.

THE NATIONAL CARBON COMPANY, Cleveland, Ohio, announces that within the next 60 days another reduction will be made on the price of its carbons. This statement is particularly interesting in view of the fact that the tariff upon imported carbons has just been advanced, which caused many people to believe that there would be a corresponding advance in the price of domestic arc light carbons.

EXCELLO ARC LAMPS.—The Excello Arc Lamp Company has received an order for 44 lamps from the Minnesota State Agricultural Society. These are to be used in extending the out-door lighting arrangements which this society began last year, when they purchased 42 lamps from the same company for the illumination of the livestock department and the lighting of the field upon which was enacted the spectacular reproduction of the Fort Ridgeley massacre.

GARWOOD AGENCIES.—The Garwood Electric Company has appointed the Tucker Electric Company, 970 Old Colony Building, Chicago, as its selling agent for Chicago and as far south in Illinois as a line drawn east and west through Springfield and including Springfield, and as far in Wisconsin as a line drawn east and west through Madison, and including Madison, and that portion of Indiana north of a line drawn east and west through Indianapolis and including Indianapolis. Mr. Tucker is very well known in the electrical field, having formerly been connected with the Western Electric Company, and recently was with the International Cash Register Company. Messrs. Fellows & Fellows, Lawler Building, Toronto, Canada, have been appointed sales agents for the entire Dominion of Canada. This firm is very well known in railway and general engineering lines.

# Weekly Record of Electrical Patents

UNITED STATES PATENTS ISSUED AUG. 3, 1909.

[Conducted by W. F. Bissing, Patent Law, 2 Rector St., New York.]

929,708. SERVICE METER SYSTEM; W. Reid, Chicago, Ill. App. filed Dec. 5, 1907. For system of central energy type, having three conductor multiple jacks at central. The meter has differential coils with means for shunting one and using the other to actuate the meter.

929,745. WIRELESS COMMUNICATION; C. D. Babcock, New York, N. Y. App. filed Sept. 25, 1905. A platinum wire terminal whose end is flush with the glass envelope and dips into a conducting liquid, acts as a wireless detector.

929,758. DYNAMO REGULATOR; S. D. Field, Stockbridge, Mass. App. filed Feb. 14, 1908. A voltage regulator for self-excited dynamos having a resiliently mounted armature and differential field windings, with a blade spring actuated by the armature to close the circuit through the windings.

929,763. ELECTROMAGNETIC APPARATUS FOR ACTUATING MECHANISMS; S. H. Hoggson, New York, N. Y. App. filed June 29, 1906. Makes use of a pivoted weighted lever operated by a solenoid to drive a mechanism.

929,773. CURRENT LEAK INDICATOR FOR ELECTRICAL CONDUCTORS; R. S. Masson, Berkeley, Cal. App. filed Aug. 10, 1908. The insulator has its surface coated with white paint, whose color changes when the current leaks through it.

929,812. PANEL BOARD CABINET; F. B. Adam, St. Louis, Mo. App. filed Oct. 19, 1908. A box is set in a wall and carries a panel board mounted on supports adjustable toward and from the wall.

929,844. RELAY; J. Erickson, Chicago, Ill. App. filed Aug. 20, 1906. An annunciator drop relay having a knife bearing carrying an armature with a sheet metal holder secured to the magnet and removably holding the armature on the pivot.

929,854. ELECTRICAL MEASURING INSTRUMENT; D. C. Jackson, Madison, Wis. App. filed June 5, 1905. Phase adjuster. Improvement on prior application.

929,878. INSULATOR; J. W. Ransom, Batavia, Ohio. App. filed July 22, 1908. A shiftable body with a groove for receiving the wire in one position of the body and for bending and interlocking it when shifted.

929,901. ELECTRIC HEATER; C. E. Trewhella and E. D. Holley, Forestville, Conn. App. filed July 17, 1907. A receptacle having a base with a heating unit in the base, a heat distributor therein, and insulation between the base and the unit.

929,918. TROLLEY WHEEL; B. Crow, Findlay, Ohio. App. filed Aug. 8, 1908. The wheel has a core with spaced radial ears integral therewith, with caps and a ball bearing.

929,933. LOW WATER ALARM FOR STEAM BOILERS; C. Brent, Brandon, Manitoba, Canada. App. filed Nov. 5, 1906. A head is filled with hot water and is converted to steam at low water, which in turn actuates a thermostat.

929,934. CONTACT DEVICE; C. Brent, Brandon, Manitoba, Canada. App. filed Nov. 5, 1906. For fire alarms operated thermally and placed in a call-bell circuit. The spring expands and makes the circuit.

929,937. GAS-SUPPLY ALARM; L. C. Bulkley, Benton, La. App. filed Nov. 20, 1908. A pivotic member is included in the electric circuit and is controlled by a thermostat with an open casing surrunding it.

929,963. BATTERY CONTACT; J. H. Gugler, Minneapolis, Minn. App. filed July 25, 1908. Improvement in binding posts for primary batteries in which the carbon electrode carries a metal contact cup, which is electroplated, to the electrode.

929,965. EXTENSION CALL FOR TELEPHONES; A. R. Marcotte, Concordia, Kan. App. filed May 1, 1908. Closes an extension call circuit by spring-pressed slides, which may be placed inside or outside of the telephone box.

929,984. MACHINE TELEGRAPH; G. C. Read, Davenport Station, Ontario, Canada. App. filed March 21, 1908. A number of separate circuits, each controlling one of the keys of a typewriter, are energized in succession by selective mechanism operated from a distance.

929,989. TELEPHONE CABINET; A. Larsson, Buffalo, N. Y. App. filed Aug. 21, 1907. A wall cabinet having a back of sheet metal and its lower part dished rearwardly, with a movable hood therefor.

929,995. SELECTIVE RINGING MAGNETO BELL; B. W. Sweet, Cleveland, Ohio. App. filed Sept. 8, 1905. An exciting electromagnet having a sectional armature, the selections being adjustable to regulate the air-gap.

929,998. ELECTRIC FUSE CASE; T. E. Murray, New York, N. Y. App. filed Sept. 28, 1908. A wrapping of non-combustible fabric surrounds the fuse, which is contained in a body of pulverized material, surrounding the fuse and wrapping.

929,999. ELECTRIC CUT-OUT; T. E. Murray, New York, N. Y. App. filed Dec. 30, 1908. A fuse plug having a base with a cover and a removable plate locked in position to the base and cover.

930,006. BRUSH HOLDER FOR DYNAMO ELECTRIC MACHINES; J. E. Webster, Pittsburgh, Pa. App. filed Sept. 25, 1905. Provides a spring guide which maintains the coils of the spring in concentric relation.

930,007. BRUSH HOLDER FOR DYNAMO ELECTRIC MACHINES; J. E. Webster, Pittsburgh, Pa. App. filed Jan. 3, 1906. For insulating and supporting brushes, having a plurality of supporting arms and insulating sleeves with sealing and protecting caps therefor.

930,022. ELECTRIC POWER HAMMER; T. F. Baily, Alliance, Ohio. App. filed May 19, 1909. Has a head for the ram and spaced flanges connected to the head with a series of transverse copper bars in grooves in the structure, which are short-circuited.

930,023. PROCESS OF STERILIZING FLUIDS; C. B. Bartley, Pittsburgh, Pa. App. filed Aug. 5, 1908. Passes a direct current through the medium to be sterilized and induces a disruptive discharge through the medium and the atmosphere between an immersed terminal and an outer terminal.

930,024. GOVERNOR; N. C. Bassett, Milwaukee, Wis. App. filed Feb. 23, 1907. For controlling a motor actuating a pump by means of a toggle and spring.

930,027. METHOD OF REDUCING ORES; F. M. Becket, Niagara Falls, N. Y. App. filed May 11, 1909. Smelts the ore electrically with a reducing agent containing silicon and boron.

930,028. METHOD OF REDUCING ORES; F. M. Becket, Niagara Falls, N. Y. App. filed May 11, 1909. Electrically smelts a charge containing the ore and a borid.

930,065. ELECTRIC STORAGE BATTERY; B. Ford, Philadelphia, Pa. App. filed Sept. 7, 1908. A battery jar having a top, perforated bottom wall and side and end walls constituting an overflow compartment.

930,067. COMMUTATOR BRUSH; F. W. Garrett, Pittsburgh, Pa. App. filed Jan. 3, 1906. Has an end cavity and slot in one corner with a cap plate having a portion that projects into the slot and a resilient stud that projects into the cavity.

930,068. BRUSH HOLDER FOR DYNAMO ELECTRIC MACHINES; F. W. Garrett, Pittsburgh, Pa. App. filed May 21, 1906. A current collector having a brush and holder, including a loop and a shunt connected with one end attached to the brush, a hook at the other end, and a spring for holding the hook in engagement with the loop.

930,126. DAMPER ACTUATOR; J. W. Barton, Flint, Mich. App. filed June 11, 1908. A temperature controlled damper, controlled by fluid pressure, whose action is in turn controlled by weights and by a magnet brake.

930,141. AUTOMATIC SAFETY DEVICE; F. F. Bourdil, Paris, France. App. filed Sept. 6, 1907. An insulator which can be rotated around its axis when the supporting wire breaks, without displacing the line wire.

930,150. AUTOMATIC CUT-OFF FOR TROLLEY LINES; R. Brown, Windber, Pa. App. filed Sept. 16, 1908. For mining use, operated by the trolley wheel to make and break the circuit so as to render the cut-out section harmless.

930,155. CIRCUIT-BREAKER; H. W. Cheney, Norwood, Ohio. App. filed Oct. 22, 1906. Oil switches or circuit-breakers having a plurality of stationary contacts and oscillatory switch member carrying bridge contacts of special construction.

930,156. OIL SWITCH; H. W. Cheney, Norwood, Ohio. App. filed Oct. 22, 1906. For a circuit of high voltage and large amperage in which the switch can be readily attached to a narrow switchboard panel.

930,171. LIQUID INDICATOR AND LEAK DETECTOR; J. Foley, Birmingham, Ala. App. filed Nov. 4, 1908. A float is actuated by the leak and controls an alarm circuit.

930,177. ELECTROMAGNET; D. J. Hauss, Aurora, Ind. App. filed Sept. 2, 1908. A compact magnet, whose parts may be readily separated and firmly secured together for bell use.

930,203. ELECTRICAL INSTRUMENT FOR PYROGRAVURE AND SURGICAL PURPOSES; L. Mandarelli, Paris, France. App. filed Nov. 28, 1908. The point is electrically heated to incandescence and is made hollow for the circulation of air.

930,212. APPARATUS FOR TREATING GASES BY ELECTRICITY; I. Moscicki, Fribourg-Gambach, Switzerland. App. filed Aug. 28, 1906. For obtaining nitric oxides from mixtures of gases by subjecting them to the action of electric current in a furnace having an annular electrode, through which the gases flow.

930,213. SECONDARY ELECTRIC BATTERY OR ACCUMULATOR; W. Moseley, London, England. App. filed March 29, 1909. An accumulator plate having a series of conical cups receiving the oxide of lead.

930,235. SYSTEM OF DISTRIBUTING ELECTRICAL ENERGY; P. H. Thomas, Pittsburgh, Pa. App. filed Jan. 20, 1903. Delivers a flow of electric current in a given direction in two or more consumption circuits from an alternating-current supply. Permits positive impulses only to flow in one circuit and negative in the other.

930,238. PRODUCTION OF LONG STABLE ELECTRIC ARCS; O. Schönherr and J. Hessberger, Ludwigshafen-on-the-Rhine, Germany. App. filed March 16, 1906. Stretches the discharge by directing a current of fluid parallel with the body of the discharge.

930,275. TROLLEY WHEEL; E. E. Ecker, Kansas City, Mo. App. filed Aug. 18, 1908. The wheel is provided with right and left-hand grooves, which act as a finder.

930,324. ANNUNCIATOR DROP; B. W. Sweet, Cleveland, Ohio. App. filed May 19, 1906. An annunciator drop with a removable armature in which the defective winding may be replaced without disturbing soldered connections.

UNITED STATES PATENTS ISSUED AUG. 10, 1909.

930,336. TROLLEY WHEEL HOLDER; J. Barry, Ocean View, Cal. App. filed Oct. 18, 1907. Has a housing having an independent pivoted movement mounted in a frame work pivoted to the upper end of the trolley pole.

930,337. BRUSH HOLDER; N. C. Bassett, Lynn, Mass. App. filed March 24, 1902. The brush is supported by two surfaces on opposite sides of the same, but not opposite each other. Avoiding rocking and chattering.

930,376. METHOD OF TREATING ALUMINOUS MATERIALS; A. C. Higgins, Worcester, Mass. App. filed May 31, 1907. Fuses an aluminous material in an electric furnace and then roasts it under oxidizing conditions.

930,388. ELECTRIC SIGNALING FIRE ALARM APPARATUS; W. H. Kirnan, Bayonne, N. J. App. filed Nov. 7, 1908. Fire alarm signaling apparatus in which a single thermostat is employed in connection with a single signal box to send a plurality of different signals over a single-transmission circuit.

930,404. AUTOMATIC GAS FEED FOR VACUUM TUBES; D. McF. Moore, New York, N. Y. App. filed May 8, 1906. A gas feed valve with an operating magnet and a thermostat exposed to the direct heat of the gas in the tube and controlling the circuit of the magnet.

930,427. BRUSH HOLDER; L. H. Sparks, Warren, Ohio. App. filed Jan. 16, 1908. A simple and durable brush holder in which the pressure on the carbon is regulated by an adjustable spring.

930,449. SNAP SWITCH; J. W. Wyatt, Philadelphia, Pa. App. filed Feb. 6, 1908. A snap switch operated by a pair of push buttons, including a spring and latch.

930,471. PROCESS OF MANUFACTURING SULPHURIC ACID; W. Hallock, New York, N. Y. App. filed July 15, 1905. Subjects sulphurous acid to the influence of an ironizing agent, such as x-rays in the presence of oxygen.

930,474. CURRENT TESTING DEVICE FOR ELECTRIC BATTERIES; W. C. Hood, Chicago, Ill. App. filed March 20, 1908. Substitute for an ammeter in which metal foil is mounted on an insulating support, the foil being of graduated widths at different points.

930,508. RECEIVER FOR HIGH-FREQUENCY ELECTRICAL OSCILLATIONS; F. K. Vreeland, Montclair, N. J. App. filed July 25, 1905. Two relatively movable coils are arranged in close inductive relation with their coils in parallel.

930,512. TELEPHONE EXCHANGE SYSTEM; H. G. Webster, Chicago, Ill. App. filed Aug. 4, 1904. For central battery systems using a cord connecting apparatus with which a relay is associated having contacts which have two operative positions besides the normal one, controlling the local circuit of the supervisory signal.

930,513. TELEPHONE EXCHANGE SYSTEM; H. G. Webster, Chicago, Ill. App. filed Aug. 4, 1904. A central battery system utilizing a cord connecting apparatus in which the connecting cord at the central office has associated with it a polarized electromagnet having differential windings and controlling by its armature the display or non-display of a supervisory signal.

930,514. TELEPHONE EXCHANGE SYSTEM; H. G. Webster, Chicago, Ill. App. filed Dec. 16, 1904. A central battery system in which the connecting cord at the central has two windings and controls by its armature the display or non-display of a supervisory signal.

930,515. TELEPHONE EXCHANGE SYSTEM; H. G. Webster, Chicago, Ill. App. filed Dec. 4, 1905. A central battery system in which the supervisory signal has associated with it a differentially wound electromagnet with its windings so arranged that one is included in a circuit local to the central office and under the control of the operator while both are included in a circuit controlled by the subscriber.

930,516. TELEPHONE SYSTEM; H. G. Webster, Chicago, Ill. App. filed Dec. 4, 1905. The subscriber and operator may signal each other and the operator may be informed of the operative condition of a connected line. Makes use of a linked circuit for interconnecting the line, the connection of the linked circuit establishing a shunt path under the control of the subscriber's switch hook.

930,517. TELEPHONE EXCHANGE SYSTEM; H. G. Webster, Chicago, Ill. App. filed Jan. 13, 1906. Two-wire telephone systems in which the talking circuit is kept free from separable contacts and the transmission current supplied in bridge of the cord circuit.

930,518. TELEPHONE SYSTEM; H. G. Webster, Chicago, Ill. App. filed Dec. 10, 1906. Each supervisory signal is directly connected in circuit between the source of current and a contact of the corresponding connecting plug of the linked circuit, and a line relay and resistance are so arranged that when the operator inserts a plug the circuit is completed through or around the resistance covered by the operation of the switch hook to control a signal.

930,519. TELEPHONE EXCHANGE SYSTEM; H. G. Webster, Chicago, Ill. App. filed Feb. 23, 1906. There is associated with the line circuit a signal-controlling electromagnet normally under the control of the subscriber whereby a call may be initiated at the central office. The invention relates to the construction of a magnet.

930,520. TELEPHONE SYSTEM; H. G. Webster, Chicago, Ill. App. filed May 4, 1906. Provides a cut-off magnet for the line circuit and switching mechanism which alters the substation control of the calling signal and controls the battery connection of the line limbs.

930,521. TELEPHONE EXCHANGE SYSTEM; H. G. Webster, Chicago, Ill. App. filed Dec. 4, 1907. Testing means common to the cord circuits with means whereby the interconnection of certain terminal contacts automatically disconnect the relay and actuates a signal.

930,547. APPARATUS AND SYSTEM FOR MEASURING TELEPHONE SERVICE; D. S. Hulfish, Chicago, Ill. App. filed April 3, 1905. For automatic or semi-automatic exchanges in which a meter is connected to the selective switch.

930,527. AUTOMATICALLY ADJUSTABLE STRAIN INSULATOR HOUSE FIXTURE; C. S. Burge, Tacoma, Wash. App. filed March 17, 1909. The plate has holes or slots suited for the reception of screws and carries an eye in which a clevis and pin are mounted, the pin carrying the insulator.

930,552. RELAY; J. M. Long, Los Angeles, Cal. App. filed March 4, 1907. A solenoid cell with soft iron core operated in the coil actuating a two-armed lever on a shaft and a two-ended contact piece likewise on the shaft.

930,586. ELECTRIC CURLING IRON; C. W. Wilmot, Redondo, Cal. App. filed June 17, 1908. A tubular handle having a detachable portion with electricity supply means and heating irons electrically connected with the supply means.

930,588. RECEIVING ELECTRIC SYSTEM; C. Wirth and C. Beck, Nuremberg, Germany. App. filed March 18, 1909. A receiving circuit, a distributor controlled thereby, electro-motors, circuits controlled by the distributor, cut-outs and gears connected with the motors to actuate the cut-outs.

930,603. CONTROLLING DEVICE FOR ELECTRIC MOTORS; C. D. Knight, Schenectady, N. Y. App. filed Feb. 21, 1907. Means for controlling electric motor circuits, particularly alternating-current motors of the induction type in which an electromagnet switch varies the resistance in the secondary circuit, and another switch closes the primary circuit when the resistance varying switch occupies a certain position.

930,606. ADAPTABLE TERMINAL CONTACT FOR SAFETY FUSES; V. F. Morgan, Hartford, Conn. App. filed March 7, 1906. Ferrules are mounted on the ends of an insulating tube and have a threaded engagement with terminal contacts.

930,608. INSULATOR; L. McCarthy, Boston, Mass. App. filed Oct. 8, 1908. Metallic connections are secured together with interposed insulation and have a covering of molded composition.

930,609. INSULATOR; M. Neubert and R. P. Jones, Glen Jean, W. Va. App. filed Feb. 24, 1908. A section insulator having spaced end pieces and an insulating strip between the end pieces. Details.

930,638. ELECTRIC SMOOTHING IRON; A. O. Whitmore, Salt Lake City, Utah. App. filed Aug. 7, 1908. Has a cover or top plate provided with an extension, the extension having an upstanding guard and depending wings.

930,644. SURFACE CONTACT ELECTRIC RAILWAY SYSTEM; W. M. Brown, Johnstown, Pa. App. filed Feb. 20, 1905. Auxiliary contact devices or studs are electrically connected with the adjacent boxes and so arranged as to be engaged and spanned by the current collector.

930,666. PROCESS OF TREATING ORES; P. L. T. Héroult, La Praz, France. App. filed April 19, 1906. Oxidizes the ore by air and heats by means of an electric current.

930,674. MANUFACTURE OF RAIL BONDS; G. A. Mead, Mansfield, Ohio. App. filed Nov. 2, 1906. The rail bond comprises a stranded body portion with stranded terminal members and terminal lugs all separate from each other and then united.

930,675. SAFETY FUSE; W. Menzel, Hanover, Germany. App. filed Aug. 3, 1906. The plug has a rib, contact pins and a fuse connecting the pins.

930,698. TROLLEY RETRIEVER; M. D. Self, Bessemer, Ala. App. filed Dec. 30, 1908. Pneumatic trolley retriever in which the air pressure is cut off when the trolley is pulled down by hand.

930,704. PUZZLE TOY OPERATED BY STATIC ELECTRICITY; E. A. Sullivan, Toronto, Canada. App. filed Aug. 18, 1908. When the glass is rubbed the particles assume a definite position forming the counts of the game.

930,723. PROCESS OF FORMING ELECTRIC-INCANDESCENT-LAMP FILAMENTS; W. Von Bolton, Charlottenburg and F. Hartmann, Berlin, Germany. App. filed Feb. 3, 1909. Inserts into a tube of ductile metal, a tube of another ductile metal and then inserts refractory metal powder into the inner tube and works the products into filaments.

930,727. STORAGE BATTERY; R. N. Chamberlain, Depew, N. Y. App. filed April 5, 1905. Each set of plates can be removed without disturbing the other set. Details.

930,728. STORAGE BATTERY; R. N. Chamberlain, H. E. Pratt, New York, N. Y., and A. S. Hubbard, Belleville, N. J. App. filed Dec. 17, 1906. A battery cell and crate having its walls provided with upright air channels adjacent to the cell and having bottom openings for the admission of air to the channels.

930,746. AERIAL CONDUCTOR; S. Eisenstein, Kiew, Russia. App. filed March 27, 1908. A supplementary capacity and a self-induction coil are used, the latter in series between the capacity and the aerial conductor and arranged on the top of the conductor.

930,750. INSULATOR; C. McL. Graham, Malvern, Victoria, Australia. App. filed Aug. 4, 1908. Glass insulators supported by wooden pin to which they are connected by a metal bolt. Details.

930,751. REINFORCED WOODEN SUPPORT FOR INSULATORS; C. McL. Graham, Malvern, Victoria, Australia. App. filed Aug. 4, 1908. Double shed insulator having a metallic central reinforcing member.

930,753. MONTOTELEPHONIC RELAY TRANSFORMER; P. E. Heina, Paris, France. Has a circular plate of magnetizable metal with three supports carrying it, the supports being arranged to correspond with the first harmonic of the plate.

930,754. ELECTRIC CLOCK; R. D. Hickok, Atlanta, Ga. App. filed Nov. 5, 1908. An electric clock having secondary clocks and a master clock, in which the secondary clocks are actuated once a minute, and the master clock at the minimum beat.

930,780. MAGNETIC DETECTOR; J. Murgas, Wilkes-Barre, Pa. App. filed March 17, 1909. Produces a stationary magnet field, in which is mounted a conducting disk of magnet material, to which the oscillations are conducted.

930,788. EXTENSION PLUG OR DEVICE FOR CONNECTING ELECTRIC CONDUCTORS; W. E. O'Neil, Norwich, N. Y. App. filed March 27, 1909. A wedge plug is interposed between the members and expands the plug when the latter is inserted in the socket.

930,815. ELECTROLYTE; A Van Winkle, N. J. App. filed Nov. 20, 1908. Electrolyte for coating iron, comprising a solution containing a fluorin salt of zinc.

930,819. ELECTRIC GENERATOR; E. F. White, Spokane, Wash. App. filed Sept. 12, 1908. Portable, manually operated generator having a metallic arm with bearings integral with the arm. Details.

930,854. TELEPHONE REPEATER; M. R. Gilson, Philadelphia, Pa. App. filed Aug. 8, 1907. Comprises a stationary field magnet and a hollow armature revolving between the inside and outside field magnets, together with means for destroying the residual magnetism of the field magnets.

930,864. BRUSH-HOLDING STUD; T. L. and M. J. Kearney, Carbondale, Pa. App. filed Feb. 10, 1908. The stud is formed of insulation with a flat tongue at one end and a detaching device having a recess into which the tongue is fitted.

930,873. ELECTRIC COUPLING; T. Maijgren, Rochester, N. Y. App. filed July 10, 1908. Means for locking the two members of the coupling against accidental separation by means of a locking notch.

930,896. ARMORED CONDUCTOR; E. D. Speer, New York, N. Y. App. filed June 27, 1908. An armored conductor with a flexible protective covering consisting of two metal strips, both corrugated.

930,902. ELECTROLYZING APPARATUS; E. L. Thorp, Nottingham, England. App. filed Nov. 21, 1905. The plate has active sections on one side alternating with active sections on the other.

930,928. ELECTRIC SWITCH APPARATUS; A. F. Berry, Ealing, England. App. filed April 6, 1906. The electric switch comprises two movable contacts operated by a solenoid magnet.

930,958. ELECTRIC GLOW LAMP; G. K. Hartung, New York, N. Y. App. filed May 27, 1904. Electric glow lamps of the Nernst type, in which a current of a cooling medium is created through the lamp, which is regulated in accordance with variations in the potential of the current supplied.

930,971. FIRE ALARM SIGNAL APPARATUS; W. H. Kirnan, Bayonne, N. J. App. filed Feb. 17, 1909. Improvements in the signal wheel and other parts of a fire alarm signal apparatus.

930,972. THERMOSTATIC CIRCUIT CONTROLLER; W. H. Kirnan, Bayonne, N. J. App. filed Feb. 17, 1909. For fire alarm signals, in which a quick-acting switch and thermostatic couples are employed to cause the switch to make and break the circuit.

930,997. ALTERNATING CURRENT RECTIFYING APPARATUS; C. P. Steinmetz, Schenectady, N. Y. App. filed April 30, 1904. For multiphase currents in which current-generating windings are used for one polarity and counter magnetizing coils for the direct current produced by the rectifier.

931,008. SUBMERGIBLE MOTOR; A. C. Durdin, Jr., Chicago, Ill. App. filed May 18, 1908. The motor has an enclosing wall and an air chamber for cooling it, and can be submerged in water without endangering the motor.

931,013. ELECTRIC HEATER; J. E. Macomber, Albany, N. Y. App. filed April 24, 1909. An electric heater with a semi-cylindrical battery, a plane front plate, an end plate situated within the end of the battery and an auxiliary plate on the end plate.

931,015. INSULATING COMPOSITION; M. McGerry, Kalamazoo, Mich. App. filed Oct. 5, 1908. Consists of asbestos pulp, slippery elm, a vegetable acid, glue, starch and water.